An Hour With Tim Leary

Computing Now!

Canada's Personal Computing Magazine

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June 1986

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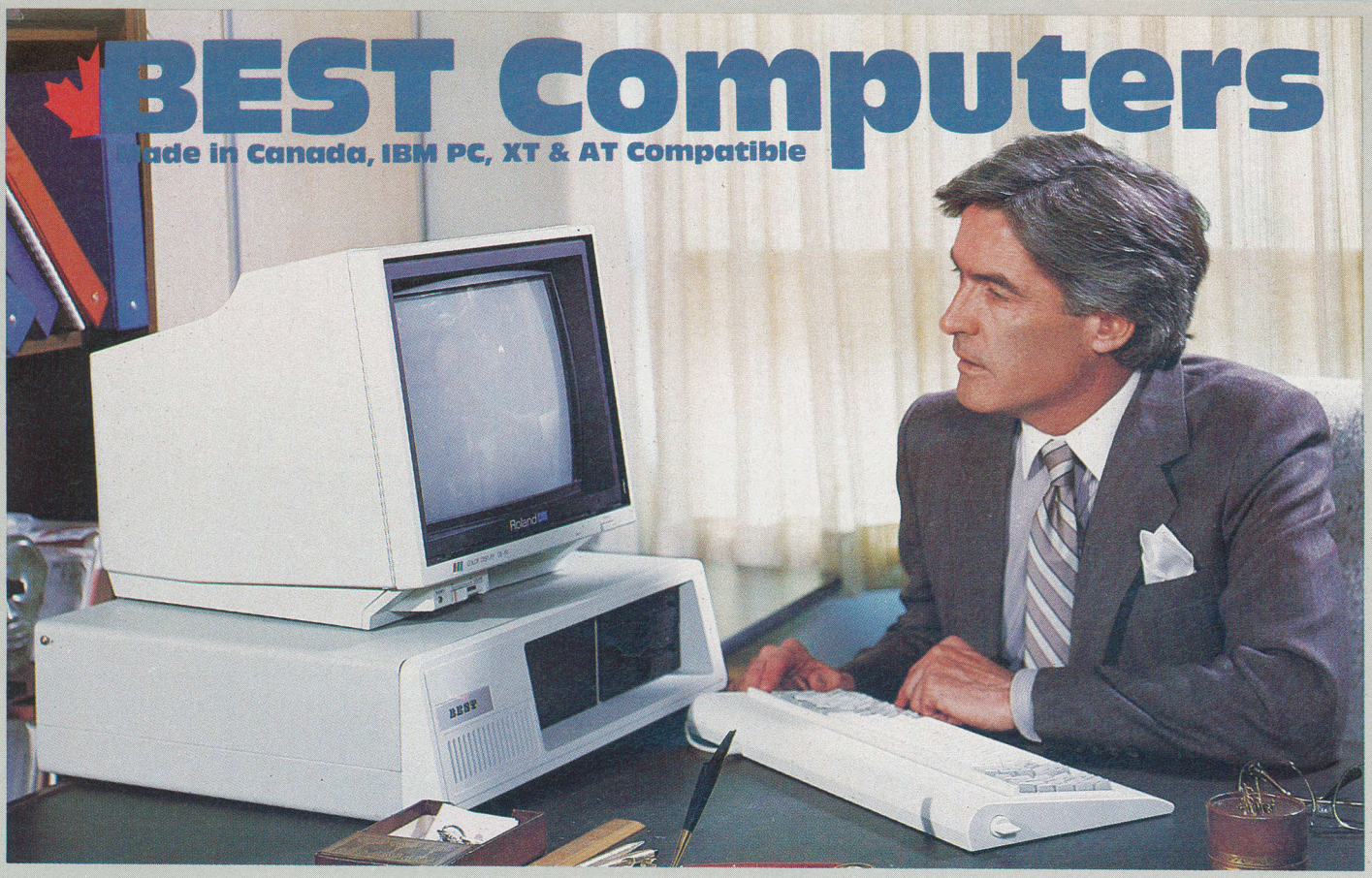

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Eugen Hutka
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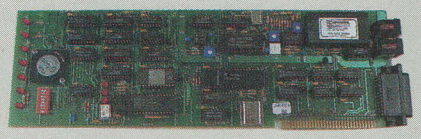

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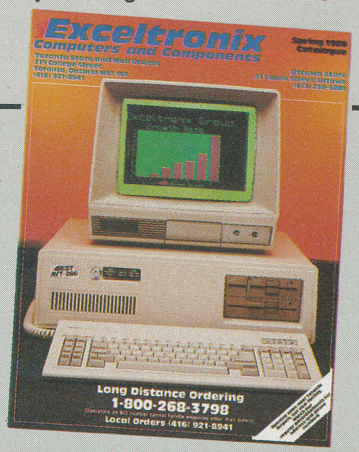

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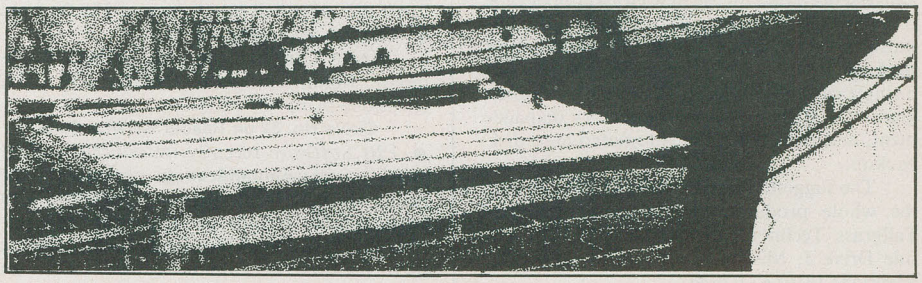
Computing Now!

Canada's Personal Computing Magazine

Volume 4 No. 3
June 1986

This month's cover photograph was executed by Ed Zapletal. Featured are the Toshiba T1100 computer, a Bill Markwick style magazine editor and Frank Lenk's authentic Yamaha bike.



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Published by
Moorshead Publications
1300 Don Mills Road,
Don Mills,
Toronto, Ont. M3B 3M8
(416) 445-5600

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Publisher: H.W. Moorshead; **Executive Vice-President:** V.K. Marskell; **Vice-President - Sales** A. Wheeler; **General Manager:** S. Harrison; **Controller:** B. Shankman; **Accounts:** P. Dunphy; **Reader Services:** N. Jones, L. Robson, M. Greenan, R. Cree, J. Fairbairn; **Advertising Copy:** H. Brooks; **Advertising Telemarketing:** Rod Macdonald.

NEWSSTAND DISTRIBUTION
Master Media, Oakville, Ont.

PRINTED BY:
Heritage Press Ltd., Mississauga

SUBSCRIPTIONS
$22.95 (12 issues) $37.95 (24 issues)
Published 12 times a year

Outside Canada (US Dollars)

U.S. add $3.00 per year.
Other countries add $5.00 per year.

Moorshead Publications also publish Electronics Today, Computers in Education, and Pets Magazine

POSTAL INFORMATION

Second Class Mail Registration No. 5946. Mailing address for subscription orders, undeliverable copies and change of address notice is: Computing Now!, 1300 Don Mills Road, Don Mills, (Toronto), Ont. M3B 3M8

Printed in Canada ISSN 0823-6437.

Circulation Independently audited by MURPHY and MURPHY, Chartered Accountants.

COMPUTER PRESS

by Marie Hubbs

New Products

Disk/Tape Combos

● *Tallgrass Technologies Canada* has recently introduced a new line of tape and tape/disk subsystems based on the new Grasshopper tape drive for the IBM PC/XT and AT and compatibles. Included in the **HopperCombo package** are the necessary mounting hardware, a single card controller, and two software programs: XTREE for file and directory management, and BackTrack for automated hard disk backup.

The suggested retail price is $3,195.00, and the whole product range is available from Tallgrass Technologies Canada, 1775 Meyerside Drive 1, Mississauga, Ontario L5T 1E2, telephone (416) 673-3244.

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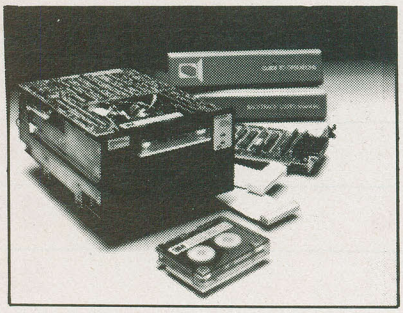

● Two new **hard disk/tape backup subsystems** have been announced from *CMS'* Small Computers Systems Interface family of IBM PC peripherals. Both with twenty megabytes, the external configuration, the Power Twin 20:20, has a retail price of just under two thousand dollars American, while the internal configuration, the Drive Plus, costs $1,660.00 US.

For further information, and Canadian availability, contact CMS at 401 West Dyer Road, Santa Ana, California 92707, telephone (714) 549-9111.

The Apple Barrel

● Triple Decker, a **hi-res colour card** for the Apple IIe, gives four times the display quality of ordinary Apple colour; has 64K, 128K or 192K RAM extended memory on board, expandable to one megabyte; allows RGB and XRGB outputs; and is supplied with a RAM-disk program in DOS 3.3, ProDOS and Pascal.

With a retail price of approximately four hundred and twelve dollars, the Triple Decker is available from local dealers, or directly from *B.Y.T.E., B & Y Technological Enterprises*, 301 Moodie Drive, Suite 410, Nepean, Ontario K2H 9C4, telephone (613) 726-9350.

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● **Prices** for two Macintosh software packages, MacWrite for word processing, and MacPaint for graphics, have recently been reduced by *Apple Canada*. Both programs formerly sold for $190.00 each, and will now carry the suggested retail price of $70.00 from authorized Apple dealers.

Apple Canada is located at 7495 Birchmount Road, Markham, Ontario L3R 5G2, telephone (416) 477-5800.

Circle No. 32 on Reader Service Card.

● *PBI Software* recently introduced CommWorks, a **telecommunications** package for the Apple IIc and IIe, which is compatible with most popular brands of Apple modems, including Hayes and Novation. Incorporating such features as communications files, an automatic log-on facility, macros and text editor, CommWorks retails for just under one hundred dollars American, and is available from PBI Software, 1111 Triton Drive, Foster City, California 94404, telephone (415) 349-8765.

Safety First!

Designed specifically for shippers, forwarders and others who need to handle **dangerous goods**, DG Consultant is a microcomputer based program which provides a number of tools to assist in the preparation and verification of the necessary forms and checklists.

Costing $249.00 for the basic package, and running on an IBM PC or compatible system, DG Consultant is produced by, and available from *The Technical & Systems Group*, P.O. Box 95, Streetsville, Ontario L5M 2B7, telephone (416) 858-1885.

Reflex-ions

Reviewed last month in Computing Now!, **Reflex** by *Borland* has recently been updated to version 1.1. Now allowing up to 32,500 records in memory and 250 fields, and offering increased support for graphics boards such as the IBM EGA, registered owners of Reflex 1.0 can update to 1.1 by sending in their old copy and ten dollars American to Borland International, 4585 Scotts Valley Drive, Scotts Valley, California 95066, telephone (408) 438-8400.

Circle No. 33 on Reader Service Card.

Next Month In

Computing Now!
Canada's Personal Computing Magazine

Creativity

In the next edition of Computing Now! we'll be looking at the computer's role as a creative tool. Among the various manifestations of this we'll be checking out will be some electronic publishing on the Mac, graphics on the Amiga, BASIC on the Atari ST, design on the IBM PC and a few things that only happen at the ends of cables. Computers are the ultimate extensions of human fingers... next month we'll see a number of new ways to get an extra couple of knuckles in there.

Serial C

Getting programs written in C to behave under DOS when you want them to talk to the outside world through one of the PC's RS-232C ports is a bit of a yak's footstool. Not only isn't the requisite code part of C... it isn't even really in any useful form in the IBM. The solution to this, of course, is to add some code of our own. A look at serial communications under C in all its glory appears in the next Computing Now!

The Last WordStar Patch Article

Actually, it's very unlikely that this will be the last one... there's always something new to hack under WordStar in order to make it more fully compatible with reality... and to undo its peculiarities and bugs. In fact, considering the almost limitless array of bugs that it does manifest, there is probably enough stuff for quite a few more of these articles. In the next CN! we're going to get inside WordStar and meddle with its bytes. This paragraph was written on a Mac, by the way... WordStar crashes if you type things like that into it.

These features are in an advanced state of preparation. However, in endeavouring to keep Computing Now! as up to the minute as possible we reserve the right to change the contents of this issue prior to going to press.

Continued on page 66

Nothing complements a great computer better than powerful, dynamic software.

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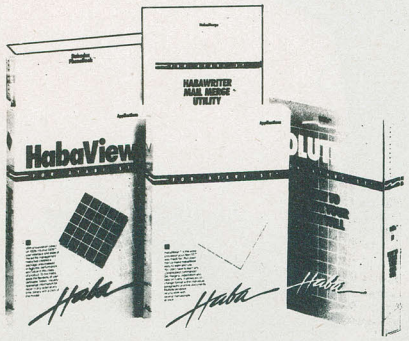

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Other titles for the ATARI ST include **HabaMerge™**, a mail-merge type utility, **Solutions: Wills™** and **Solutions: Business Letters™**.

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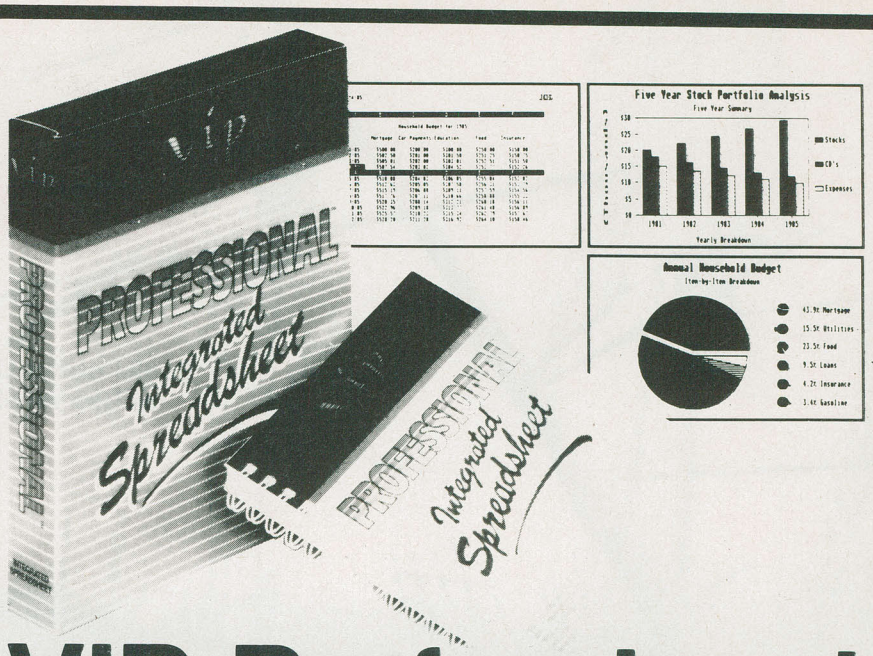

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Hard Copy at C

Books about C used to be rare... now they're springing up like mushrooms. Here's a gathering of the most common ones.

by Steve Rimmer

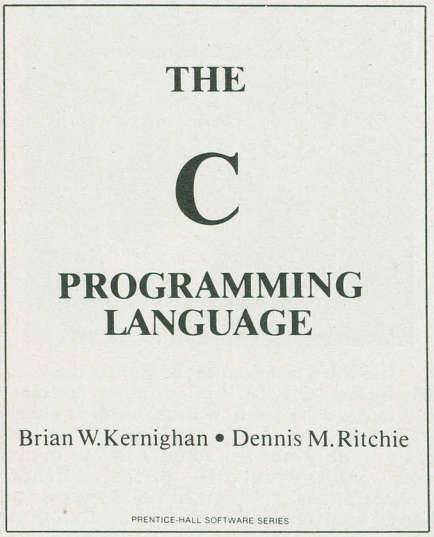
We used to have to request books to review. Now they just show up. They come in padded envelopes, in boxes and in weird cardboard things that require explosives to open. We get a minimum of a half a dozen assorted computer books a week.

Of late, the books about the C language have been proliferating considerably. There seems to be one appearing every other day or so. This is weird... I thought that all the real interest among book publishers was in Pascal just now.

If you're just getting into writing in C, this awesome deluge of books may prove a bit daunting. It does for us, and we just have to carry them around. As such, this article is going to have a look at some of the books currently available to teach you to write code in C.

Book Of The Dead

If you're like most people, having a number of C books around is a worthwhile thing. There's usually something that's ambiguous in one and clear somewhere else. Until you get really fluent in C, it's hard to get a handle on everything right at the onset.



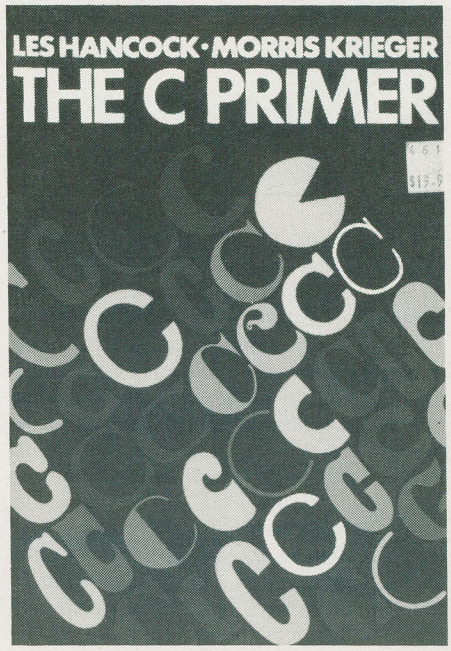
The fundamental book of C, of course, is *The C Programming Language* by Kernighan and Ritchie, published by Prentice-Hall. This is the definition of standard C, having been written by the language's authors back when it was just a germ of code on a mainframe system at Bell labs. It has the distinction of being the thinnest of any of the C books, and the most complete. It's also the hardest to understand in many areas, and leaves a fair bit to intuition. However, if you are going to program in C you *must* have a copy of this book, no matter how intimidating it first seems.

A great deal of the confusion surrounding C... when you first get into it... is wrapped up in the interpretations of this book offered by later works. In understanding the rationale behind the way the language works, one can solve one's problems by understanding what's happening, rather than simply by looking up canned solutions and applying them without really knowing what they do. However, this is a double edged sword. If you can't get your head around one of the often times brief explanations in Kernighan and Ritchie you're usually stuck. This book is written for fairly adept programmers, with a lot of the basic notions of the workings of a language assumed by its authors.

One of the things that one eventually realizes about C and its attendant flotilla of books is that C was very definitely written for mainframes, and that Kernighan and Ritchie is firmly rooted in a mainframe computer universe. When C was written, microprocessors weren't even a scratch on somebody's paper cube. Despite the oft gloated on portability of C, the remaining books are all written for microcomputer users of C and, a such, make it a lot easier to understand in this context.

It's extremely useful to have a few less complete, but also less demanding, C books. The *C Primer Plus*, published by Plume, is one of the best of these sorts of books in creation. It's passingly huge, several times the size of Kernighan and Ritchie, but it's a much easier read. Despite its size, there are aspects of C that it doesn't really get around to, but these are fairly obscure. It has lots of sample code and its pretty lucid. It's a comfortable place to go when Kernighan and Ritchie toss you out on your ear 'cause they think you're an idiot.

Don't take it personally. Kernighan and Ritchie treats everyone like an idiot from time to time.



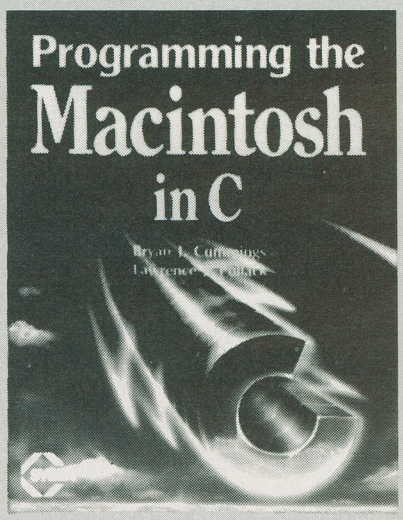
Perhaps an obvious lesser effort, the *C Primer*, published by McGraw Hill... note the absence of the "plus"... it's a different book... is quite a bit thinner than the above work and very much more basic. It'll get you into C even if you can barely program a coffee maker, but it won't get you very far. It leaves out whole chunks of C, and isn't very detailed about the stuff it does manage to deal with. Such things are a bit subjective, but I really didn't get into this one.

The *C Language Handbook*, from Ballentine Books, is among the thickest of all the C books we'll look at here, occupying well over an inch of shelf space. This is another volume with a singularly unimpressive karma. It tends to skip over things that its authors... who remain nameless... didn't seem to want to speak about. It's very

Last Minute C Books

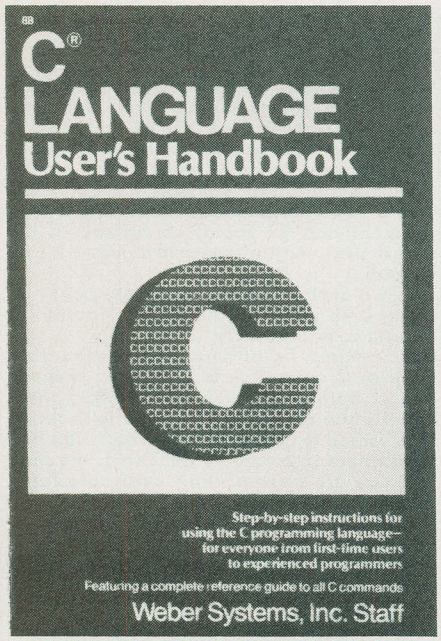
Just as we were getting ready to shoot all this off to press, we got laid upon us another battery of C books. These represented an uncommonly good lot of writings, and, as such, we've ripped out the advertisement that was going to go in this space to tell you about them. The advertisement can be found elsewhere in the magazine... it didn't seem to object to being moved.

Two of the new arrivals were books on using C to program the Apple Macintosh. This is a particularly useful trip... if you have a Mac... as, although there are rather a lot of C compilers for the Mac, there is almost nothing written about using them beyond the manuals that come with them. This serves to compound the confusion one encounters in trying to deal with the Mac in C, as all the literature available for it wants to have it talked to in its native Pascal... grunt. These two books are, to varying degrees, almost essential for anyone who wants to use a C compiler on the Mac.



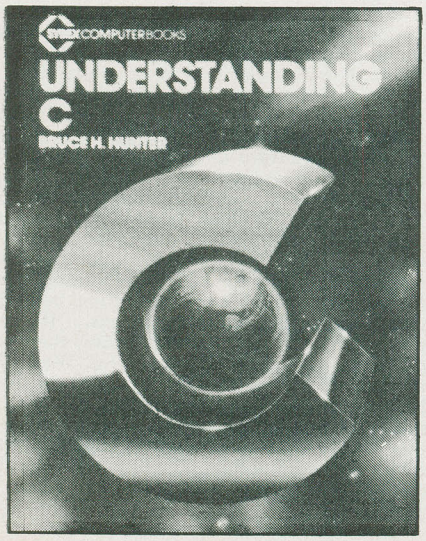
The thinner of the two books, Programming the Macintosh in C, from Sybex, is really just an introduction to C in general, although it gets into the Mac for examples and such. In fact, this is one of the most basic of all the C books I've checked out here... it will make you moderately fluent in C even if you've been dead for a year and a half. It's a good trip if you're going to learn C on a Mac... if one is going to get a primer, one might as well score one that uses familiar examples.

The other book, Using the Macintosh Toolbox with C, also from Sybex, is a quintessential work... and extremely thick... that will serve as a bible for anyone who even thinks about programming the Mac. It's loaded with example code, oozing with pretty lucid explanations... it's a perfect framework for constructing the application of your dreams around. While I wouldn't want to attempt to use C on the Mac without a copy of Inside Macintosh, this book is a superb translation of that obtuse bit of documentation into English that can be understood by C programmers. It can't be too highly recommended.

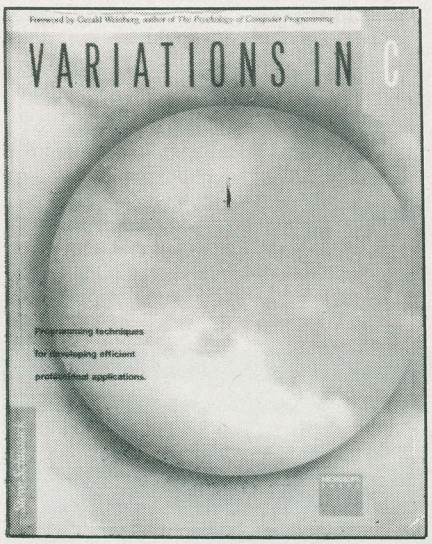


detailed in some places, but those were never the places I needed help with. It's a bit hard to find things in at times... and it's a dry, arid, parched, stultifyingly dull read. It makes one think of someone's internal house manual which has been bought cheaply by a publishing company and printed as a book... perhaps what it is.

Understanding C, from Sybex Books, is one of the least complete C primers around, although it has a lot to commend it. The stuff it does cover is handled fairly well, being reasonably easy to understand and not all that hard to get through. There are some interesting bits at the back, including a list of microcomputer based C compilers and their various features. This is a bit dated, but potentially useful.



One of the more recent books that's shown up, *Variations in C*, from Microsoft Press, is a very much more advanced and specialized book than the above-mentioned ones. It's also... not surprisingly... wholly wrapped up in Microsoft's implementation of C for the IBM PC. This is cool... if you have Microsoft C... but it can get a little confusing for other C compilers.



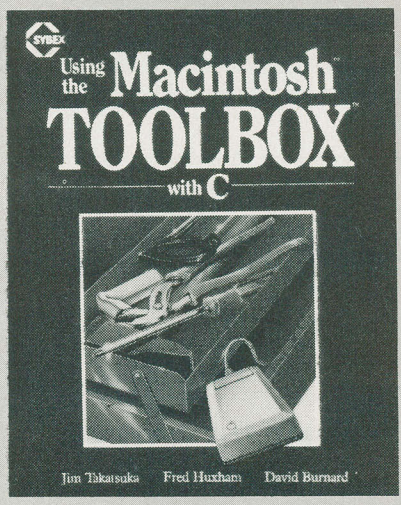
This book is one of several which doesn't really offer to teach you C, but, rather, will turn you onto a collection of interesting tricks and approaches to certain sorts of programming problems. These things invariably get into a lot of heavy data manipulation... I have yet to find a use for this level of information juggling, but you might well be into it. I confess, I write a lot of frivolous music programs, telecommunications toys and games in C... perhaps not the ideal place for matrix inversions and such.

The style of the book is heavily into yuppie modern page designs... there's purple ink everywhere... and it reads a bit less painfully than most of the C books one encounters. Like many computer books, this one has moments wherein the author has a hard time remembering whether he's writing a primer or an advanced brain stretcher. However, its lapses are few.

Beware The Doctor

One of the recent books that we've received to beware of is *Dr. Dobbs Toolbook of C*, distributed in Canada by Prentice-Hall. This is a gargantuan phone book of a work, a massive tome loaded with source code, pithy, lucid explanations and well thought out explanations. Clearly, this is a book by programmers for programmers. The catch is that it's about small C, a very restricted subset of C that exists as a public domain C package. Furthermore, it's primarily a CP/M based package, although an MS-DOS version has cropped up. See our almost free PC software disk volume nine.

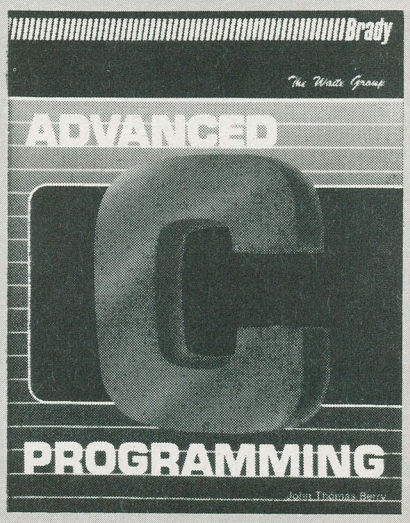
Last Minute C Books

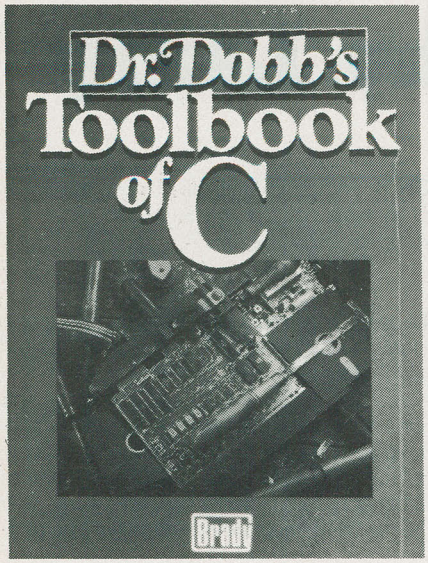


The third and last of the Sybex books is Mastering C. It's yet another primer, although a better one than most. It starts off simply, but gets pretty hairy early on. It's probably not the ideal book to begin with unless you like things difficult, although it is a decent brain stretcher for heads who have already gotten into C to some extent. This is a better book than almost all of the others we've looked at here for dealing with the subject of data types, one of the fundamental confusions for programmers who move from BASIC to C.

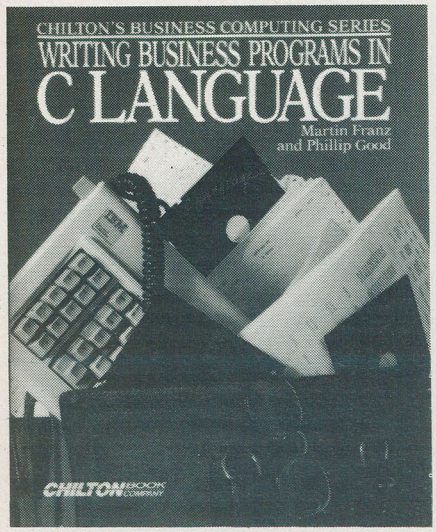
Finally, Advanced C programming, from Brady, is an interesting book. It skips over great waving tracts of C altogether... not surprising, as it's barely thicker than Kernighan and Ritchie... while working on the single goal of illustrating the writing of a data base manager. This isn't a bad trip... it's a nice walk through the creation of a practical application, with lots of example code. It isn't very exciting code, but, then, exciting code is usually too specialized to matter to anyone but the dude who wrote it.

At over thirty dollars for about two hundred pages, however, this is one of the more expensive ways to get into C.

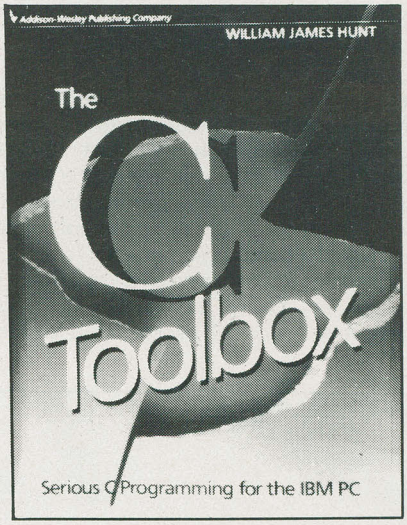




If you're working in small C, this is a superlative book. It does have lots of good ideas for users of other C compilers, and it's a decent read... although you'll have to know your stuff fairly well to be able to catch things that are specific to small C.



Among the recent converts to computer book publishing, Chiltons seems to have attacked it with a vengeance. A few years ago all they seemed to be good for was repair manuals for pickup trucks. One of their recent efforts, *Writing Business Programs in C Language*, is a peculiar little work of indeterminate purpose and a very hard read. It offers a very restricted subset of C's functions, with everything being related to business applications. It's unclear as to whether the book was intended for C programmers who want to write business software or business types who suddenly feel a need to program in one of the least comprehensible languages in creation for no apparently good reason. It's not a real party at either. If you have some C language experience, and relate to business better than anything else, this might be a good book to check out. However, it's far from either a complete introduction to the language or a comprehensive treatise on writing business code.



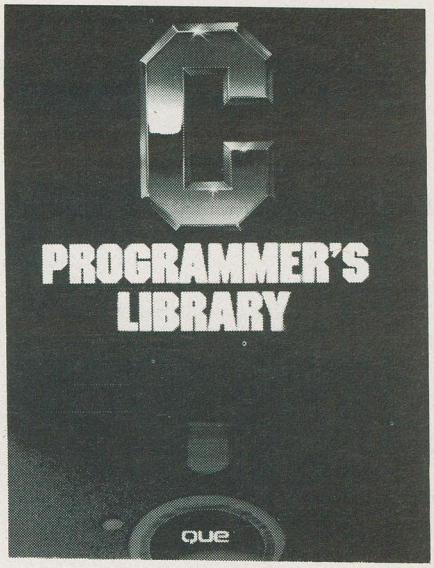
Addison-Wesley has released *The C Toolbox*... sooner or later they're going to run out of names for C books. The end is clearly in sight. This one is very heavily dedicated to C on the IBM PC. It basically deals with the language by offering one the source code for several potentially useful utilities and getting into the details of how they work. The writing isn't exactly enthralling, but the explanations are clear and well thought out. Watching real live code do its thing is one of the best ways to learn a language, and this is one of the best books of this sort I've encountered. It's not a primer... you'll have to have a decent grounding in C to make anything of it at all... but it's a reasonable effort once you get into it. The sample code can form the basis for a number of interesting programs of your own.

Que Balls

This most recent crop of C books brought in a record three of them from Que. All three are fairly advanced, and each will find use with certain sorts of programmers.

C Programmers Library starts off with a textbook about C. It's pretty brief, and, in many cases, you have to know C pretty well to understand the stuff in the text book. However, this part of the book gets into a lot of the ideas that the latter half of the work explains, and, as such, is moderately useful.

You have to be something of a programming god to have need of the second half of the book. While it will prove useful to some heads, one rarely gets into writing the sorts of massive code that thing gets into. It outlines a very sophisticated disk file



handler, a terminal library and then gets into a small database manager.

By comparison, *Common C Functions* is a book that will be useful to almost anyone. It has heaps of little program fragments of the sort that usually form the basis of applications programs. It can save one a lot of time in writing this kind of code from scratch, and it serves as practical examples of some of C's more peculiar aspects.

Finally, *Advanced C Techniques and Applications* is pretty well what it says it is. It's primarily concerned with using C in fairly sophisticated operating system environments, and is the only C book I've checked out that gets heavily into graphics. It talks about icon based operating systems and lays down some code to get one started with writing the routines that these things are based on. This is a rather interesting book if you really want to stretch your fingers a bit.

Cracking Shelves

This is by no means all the C books that have been released in the past while... it is most of the ones I've seen. However, it's probably fair to say that I've passed over some that looked to be complete dogs. As well, even as a I write this, more of the little trolls are approaching.

With these things costing upwards of twenty dollars a pop, one should check out the books one is considering carefully. Quite a few of the pretty despicable ones that I've encountered have looked good for the first few pages. With the heavy growth of interest in C in the past while, some publishers seem to have printed anything even remotely applicable to it. Watch for *Hydraulic Nose Clipper Design in C*, *C for Indo-Latvian Dwarfs* and *How To Calm a Barking C Compiler* in the next few months... they're sure to roll off someone's presses.

CN!

An Hour with Timothy Leary

"I believe in reality." This matter of fact statement comes from an unexpected source, psychologist and part time subculture guru doctor Timothy Leary. It's hard to resist taking this single statement out of context, just to admire it for a moment. However, the proper context has nothing to do with drugs and psychedelic sixties escapades. We are now discussing computer software.

Originally a professor of psychology at Harvard, eventually a touchstone for an entire generation of do it yourself mind explorers, Leary seems to have come full circle. The publication by Electronic Arts of his first computer program... Mind Mirror... looks like a return to hard core psychological practice. Leary doesn't see it quite this way. "I see it as a spiral," he says. "I've always been a psychologist, but my experimental techniques have varied."

Mind Mirror, the program itself, is reviewed elsewhere hereabouts. However, publication of the program provides a unique opportunity for us to peer into the uniquely expanded mind of its author. Timothy Leary has written voluminously on the various episodes of the long, amazing trip that followed his precipitate departure from the ivy covered halls of the establishment. What follows is a brief status report on only the latest... ongoing... leg of the journey.

Ongoing Realities

CN I guess the simplest place for me to start is ... I gather Mind Mirror was put together by your company, Futique. I wonder what the company does, and what you do in relation to it...

Leary It's kind of an information age alliance more than a company. We have ten writers, programmers... including a partnership with a company called InterPlay. You see, I'm not a programmer. I'm a designer. I'm a psychologist, I'm a psychometrist... converting thoughts into numbers. I'm sixty-five and my partners are all twenty-five.

What we do is the writers, the designers, the psychologists, the programmers... we design software. Mind Mirror's the first one. We're working on a second version of Mind Mirror called Head Coach. And we have the software rights to a science fiction book called Neuromancer. It's by a Canadian, by the way... William Gibson. We're working on the electronic novelization of the book.

We're (also) working on an electronic novelization of Herman Hesse's The Glass Bead Game.

CN I'll be very interested to see how you computerize that. What is Futique in relation to yourself? What kind of company is it?

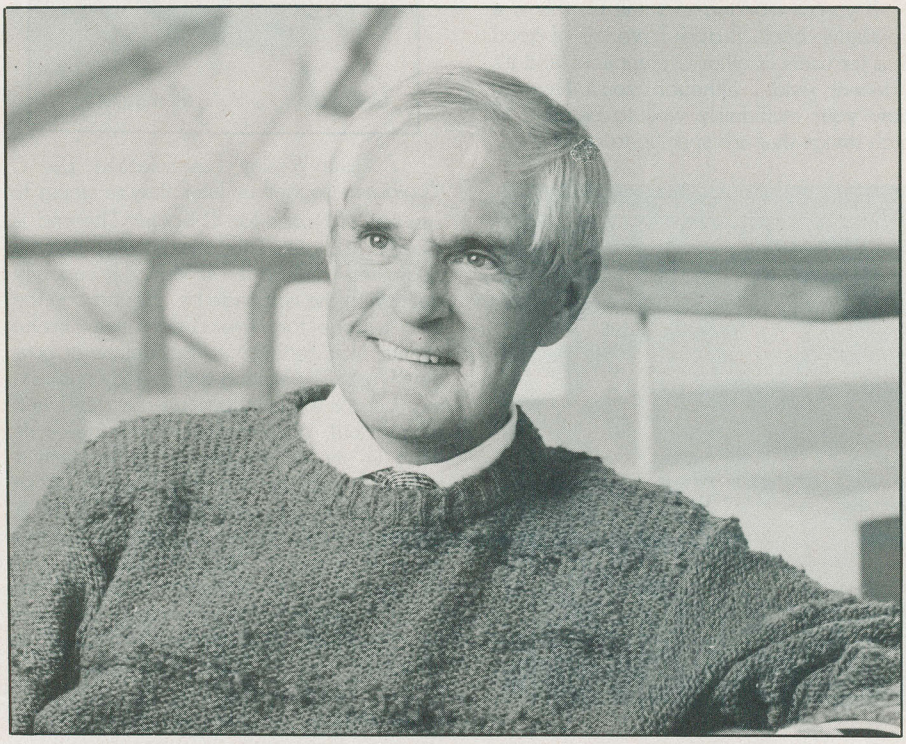
Leary What we do is make partnerships for products. When a venture financer comes in, they buy shares in a product. It's like making movies, in a way. Here's the script, here's the outline, and here's the programmer... he's the star. It's the sort of corporate structure that lends itself perfectly to the information age. There's no overhead, there's no offices... You're leasing the minds of some very intelligent people for a limited amount of time with a very well assured payback. It's a nice clean way of doing business that avoids bureaucracy.

CN Obviously you're taking advantage of Electronic Arts to get the stuff out there.

Leary Electronic Arts is our publisher. I know we'll publish a lot of it with Electronic Arts.

CN Are you devoting all of your time now to software, or do you have a book in the works at the same time?

Leary I'm writing a book on electronic literacy. It takes up the cultural, social and psychological... the evolutionary implications. The basic idea is that when you change your technology, your thought process, you create a new language and a new culture. The invention of the printing press nationalized the language. The book was the first mass assembled industrial product.



While usually associated with drugs of the sort you really can't get any more, Timothy Leary has looked to many areas for avenues into the human mind. His latest tool is software.

by Frank Lenk

CN When do you expect the book to be published?

Leary I expect that to be out by Christmas.

CN Well, I'll be curious to see where you expect computing to take us.

Leary Well, the basis of all my work for the last twenty-five years has been TFYQA,

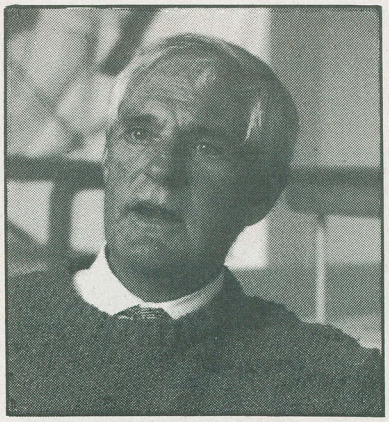
think for yourself and question authority. My personal computer software... headware... is designed to give the individual the power. We don't call it *artificial* intelligence, because that's an oxymoron... a contradiction in terms. Artificial intelligence... what you're talking about there are billion dollar machines which are by definition owned by insurance companies, by big corporations. I'm interested solely in individual intelligence and its evolution.

CN As long as you bring up the TFYQA thing, it would be interesting to hear what your stand is on things like hacking and software piracy. Now that you are on the other side, part of the software establishment... what do you think of people who are undoubtedly going to pass around copies of your program?

Leary Well... remember, I believe in reality. I probably shouldn't say this, but I'm not at all concerned about individuals sharing my work. But if... you know... they start cranking it out and selling it, that would be unfair.

Basically my position on piracy is that the laws of copyright are not going to work fifty years after the death of the author, the way they did with books. Your solution to that is an information age solution. You've got to keep moving your product as fast as you can. You don't want to copy last week's magazine.

CN I've interviewed other people on this subject, and the consensus seems to be that



there has got to be a new outlook entirely on what copyright means.

Leary I've lectured at the University of California law school in Berkeley on that, and basically I think if there's anything in the electronic ozone, it's free.

Did you hear about that thing where they sabotaged HBO? And this HBO guy was just fulminating: "Criminals!" If it's up there, why can't anyone bounce their stuff off it? Of course I just love the idea of this individual outwitting the establishment.

CN You have talked in your writing about "inventing new crimes". It seems like piracy is the new crime of the eighties.

Leary Yeah... as long as it's not a violent crime. A mental crime, yeah.

CN To what degree are you using computers yourself?

Leary Well, I use them a lot. I have an Apple, and I have an IBM, an Atari 800 and I have an Atari ST.

Oh, I should have told you this. In the next version, in Head Coach, we're going to do away with a lot of the words and we're going to use icons, and we're going to use sound and voice. If you're doing a rating scale and say the idea is "friendly", you start off with little face with no smile at all. If you move it to the right the smile gets bigger

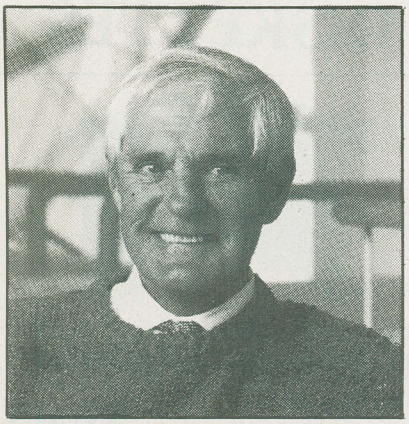
and bigger, till pretty soon it's wide open and joyous... happy, happy bliss. The other way it becomes frowning, frowning till eventually the person is weeping and sobbing. So now you try to cut down the verbal as much as maybe fifty percent, develop a basic language of icons and sound... using the abilities of the better graphics machines.

CN Yeah, I noticed that you have two layers of terminology in Mind Mirror, and neither layer is necessarily indicative of what you're trying to get at, I suppose.

Leary Also the reason for that is that we're going to put it into multi-language disks. The reason I have those two... Shrink Rap and Plaintalk... the real reason for that is that I can put it in French, Spanish, German, Russian...

CN Where is the program being used? I thought, for instance, that educational applications would be a natural.

Leary Yeah, we're working with associations. Also, I've been appointed a faculty member in the California Family Studies Center. That's a graduate school that graduates a hundred and twenty-five a year... in family guidance counselling. They're using Mind Mirror as their guidance tool in treatment... teaching... So you're going to see a lot of psychological applications.



CN That's really almost a return to psychology for you... you've taken the long way round.

Leary Well, I've always been a psychologist... but my experimental techniques have varied.

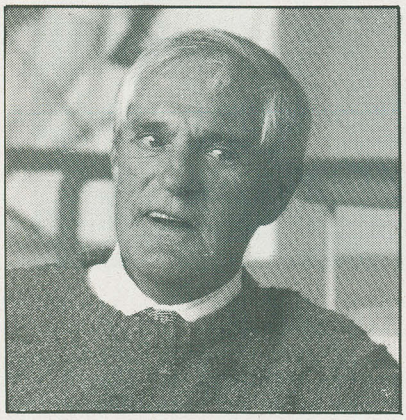
CN Yeah, right.

Leary The word psychedelic... I don't use it now because it's out of fashion, but it means "mind manifesting"... which is exactly what Mind Mirror does, it helps you manifest your mind. But I don't dare use it (the word) now. It's out of vogue. It'll come back I'm sure in twenty years.

CN I guess it's been said that drugs were for a particular time and then were bound to go out of fashion. I've heard people call computers the drugs of today...

Leary Yeah, the mind changers.

CN I wonder how this has all integrated into your own... unique... trip. It seems to be a sort of continuum... you've come full circle.



Leary Well, I don't see it as a circle... I see it as a spiral. You have to use the technology of the time... psychometric tests, drugs... now we have the computer, the most powerful technology for expanding the mind.

CN So where do you see this all going. For instance, AI. Are we replacing ourselves?

Leary Oh, that's a tremendous fallacy. It's true the bureaucracies are going to spend billions of dollars on big machines that will replace bureaucrats. But all of my work... and the future of computers... is going to be enhancing individual intelligence. So that we're going to use software programs... headware programs... as extensions of our minds, so that we become more creative, more imaginative, more innovative, more intelligent, more precise, better communicators.

CN What about machines that try to think for themselves. Do you think we'll find one that will approximate human thought?

Leary Well, you can get a computer program that will think like a bureaucrat clerk. But the people that have made that are, you know... oil geologists, or the admiral who wants a computer that will tell him the armament of every ship within two hundred miles of his aircraft carrier. You're going to get machines that can think better than military bureaucrats, or civilian bureaucrats... but those donkeys can't think that clearly anyway. They've never had a new idea. The people that are trying to build the big monsters... well, they're the ones that have no faith in their own individual intelligence anyway.

CN You did a program on television in which you used the phrase "artificial stupidity"...

Leary Yeah.

CN What was that program, how did it come about?

Leary That was CITY television. That was up in Toronto.

CN How did you get involved with them?

Leary Well, I do a lot of lecturing in Canada, and they were aware of the fact that, you know, I'm into computers...

Matter of fact, the way it probably turned out is they called me and wanted to do something on the TV with drugs, so I said "Hell no, but I'll do it on computers." They said okay. That's what happens a lot.

CN What about some of the things you were talking about in the mid seventies? That was your period of "exopscychology" and

SMI2LE (space migration, intelligence increase, life extension). Where do you see all that these days? This is very relevant to some of the things that have happened in the space program.

Leary Yeah. Well, you see, the failure of the NASA thing (the shuttle) was a failure in communications. Turns out NASA... we knew it all along... NASA was this *horrendous* bureaucracy... worse than the military... that they were kind of a sacred cow. So that, it's tragic, but that's not a failure in the space program.

Now there are many of the friends that I was working with... in, you know, in the L5 Society... and space activists, and so forth... who are now forming their own companies. A friend of mine... a partner of mine, George Koopman... has started the American Rocket Company. He's hired away some of the top NASA guys who were so pissed off and bored. So decentralization and civilianization, and thinking smaller is happening in space. Which is wonderful.

CN How far are they going to get without the billions of bucks that NASA uses?

Leary Don't need that. That's all bureaucracy. The NASA thing... you know what it was... it was these bureaucrats who were playing sweetheart deals with four or five of the top companies, with a total monopoly. It was ridiculous to use the shuttle as a truck to send up satellite stuff. They were doing that for economic and bureaucratic and industrial reasons... that they had an enormous investment in the shuttle and they wanted to use it for their own purposes. No, no... that's why you don't need billions.

CN Just one or two more things. Where are you living now?

Leary I'm living in Beverly Hills.

CN Beverly Hills? Er... I guess being on the fringe has payed off in the end...

Leary I'm living beyond my means as usual. Well, so far Mind Mirror has shipped more... of course it's only IBM... they've shipped more copies than any IBM product by far for the company. It's breaking all records. So hopefully I'll finally be able to pay the rent.

CN Well, I think your last book... Flashbacks... did well?

Leary That did well, yeah.

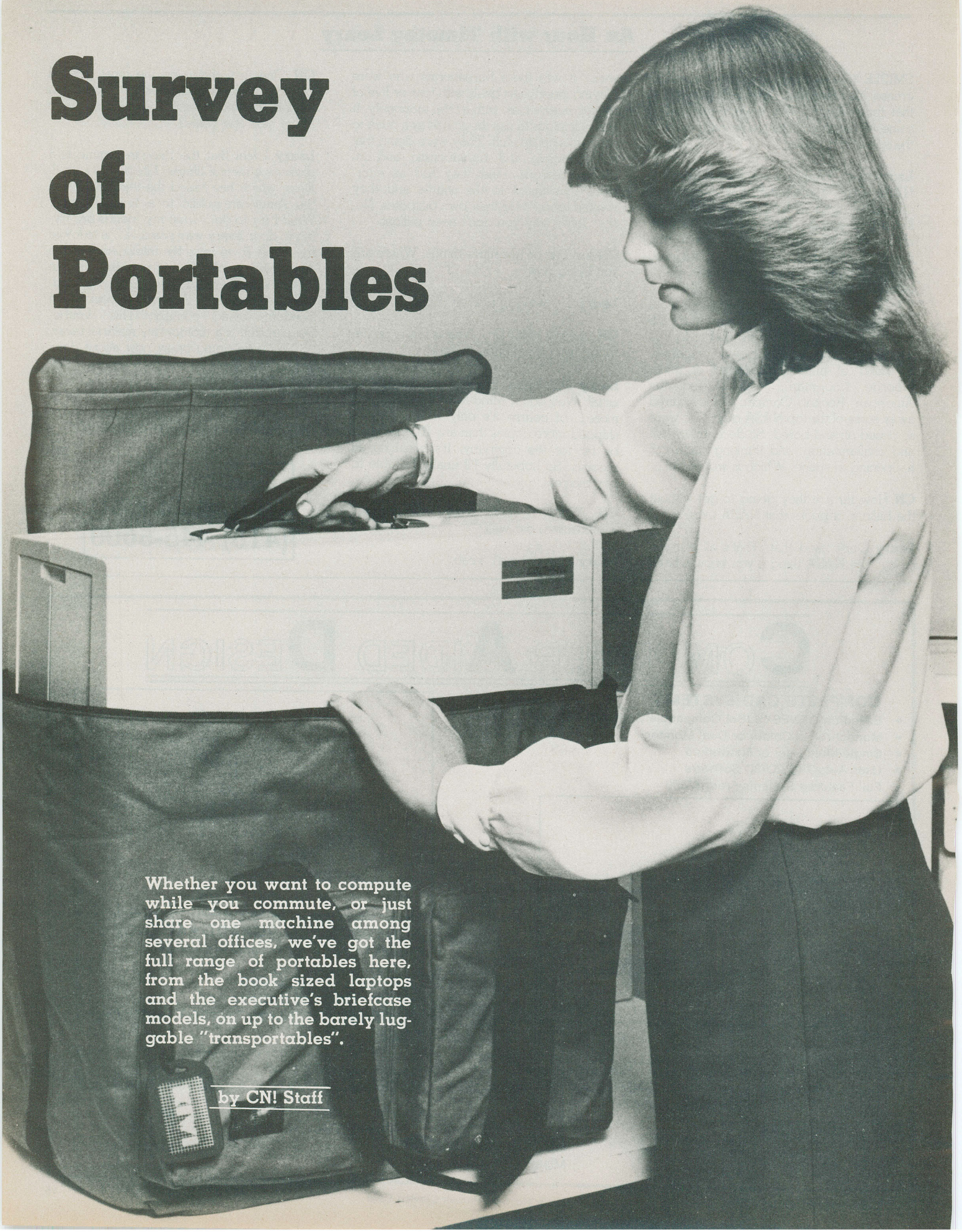
CN One final thing, on the most general possible note. That is... sort of... what you think of the world situation. What do you see in the next few years?

Leary I feel that the Reagan regime is a disastrous mental illness. Literally, it's an illness, which has raised the temperature of the American public to a feverish pitch. What I try to do... what my friends are trying to do in every way possible... is to lower the fever. If we raise the intelligence of the American people by one percent, we can bring the temperature down from one hundred to ninety-nine. America is basically a freedom loving country. This Rambo-Reagan stuff is a momentary malarial fever.

We'll be going crazy now about drug testing and about testing for loyalties... one thing they should test for is intelligence. That's what we're trying to do. I believe in intelligence. If we can help you get smarter I'm confident you'll do the right thing.

CN!

Survey of Portables



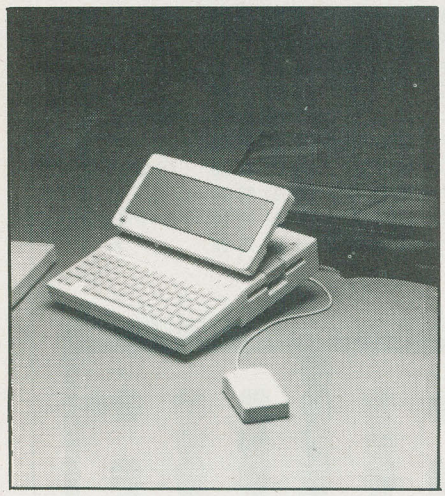
Whether you want to compute while you commute, or just share one machine among several offices, we've got the full range of portables here, from the book sized laptops and the executive's briefcase models, on up to the barely luggable "transportables".

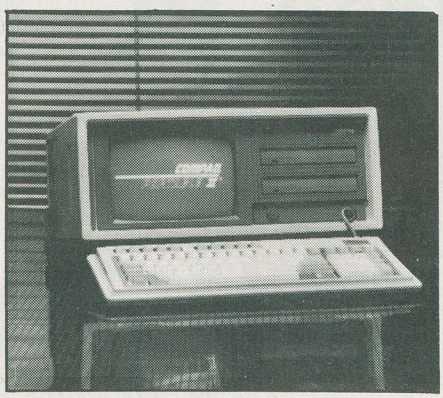
by CN! Staff

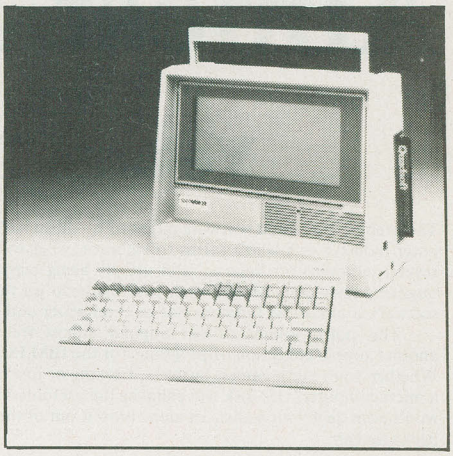
Survey of Portables

Apple IIc

Manufacturer: Apple
Op. System(s): ProDOS
RAM Memory: 128k
Storage: One 5 1/4", SSSD floppy, 143K
Display: Removable LCD, 80x24
Weight: About 12 lbs.
Software Inc: ProDOS, tutorial
Features: Power supply
Suggested Retail Price: $2,195.00
Availability: Apple dealers







Corona 400 Portable

Manufacturer: Corona
Op. System(s): MS-DOS
RAM Memory: 256K, to 512K
Storage: Two floppies, 5 1/4", 360K
Display: 640x200, green, mono., 80x21, 9"
Weight: 30 lbs.
Software Inc: DOS, GWBASIC
Features: Automatic switching, IBM graphics to hi-res. alpha-numeric graphics
List Price: $2,615.00
Availability: NCI Nielsen Computers

Epson Geneva (PX-8)

Manufacturer: Epson
Op. System(s): CP/M 2.2
RAM Memory: 64K, to 128K
Storage: Cassette; microfloppy optional
Display: LCD, 80x8
Weight: About 6 lbs.
Software Inc: Portable WordStar, spreadsheet, scheduler; utilities.
Features: Battery powered
Price: $1,495.00
Availability: Epson Canada

Commuter

Manufacturer: Visual Computer
Op. System(s): MS-DOS 2.1
RAM Memory: 126K, to 512K
Storage: Two floppies, 5 1/4", 360K
Display: LCD, 80x16; mono. or colour optional
Weight: 16 lbs.
Software Inc: MS-DOS
Features: All ports included
Price: $2,995.00
Availability: Nelma

Corona AT Portable

Manufacturer: Corona
Op. System(s): MS-DOS
RAM Memory: 512K
Storage: 1.2 Mb floppy
Display: Green, 9", 80x21
Weight: About 35 lbs.
Software Inc: MS-DOS, GWBASIC
Features: (same as above); 80286 processor, 8Mhz.
List Price: $7,535.00
Availability: NCI Nielsen Computers

Compaq 286 Portable (model 1)

Manufacturer: Compaq
Op. System(s): MS-DOS
RAM Memory: 256K
Storage: One floppy, 1.2 Mb
Display: 9" mono. monitor, 640x200
Weight: 30.5 lbs.
Features: 80286 processor
Price: $6,999.00
Availability: Compaq dealers

Data General/One

Manufacturer: Data General/One
Op. System(s): MS-DOS
RAM Memory: 128K, to 512K CMOS RAM
Storage: One microfloppy; 5 1/4" optional
Display: LCD, tiltable, 640x200 mono.
Weight: Under 9 lbs. (4 kgs.)
Software Inc: BIOS in ROM, MS-DOS, others built-in
Features: Terminal emulation; text edit and export
Price: $3,403.00 (256K)
Availability: Data General

Ericsson Portable

Manufacturer: Ericsson
Op. System(s): MS-DOS
RAM Memory: 256K, to 512K
Storage: One floppy, 5 1/4", 360K; second optional
Display: Plasma, 80x25, with graphics 640x400
Weight: 14 lbs.
Software Inc: MS-DOS, GWBASIC, diagnostics, tutor.
Features: Printer, virtual disk optional
List Price: $4,400.00
Availability: Ericsson

Compaq Portable

Manufacturer: Compaq
Op. System(s): MS-DOS
RAM Memory: 256K, to 640K
Storage: Two floppies, 5 1/4", DSDD
Display: 9" mono. monitor, 640x200
Weight: 28 lbs.
Software Inc: MS-DOS, BASIC
Features: Parallel and serial ports
Price: $3,699.00
Availability: Compaq dealers

Datavue Phase II

Manufacturer: Quadram
Op. System(s): MS-DOS
RAM Memory: 256K, to 1.3 Mb
Storage: One floppy, 5 1/4"; internal HD, second floppy optional
Display: 80x25, LCD or backlit
Weight: 12 to 16 lbs.
Software Inc: DOS, diagnostics
Features: Infra-red keyboard; AC adapter; ports; RAM drive
Price: $2,995 (LCD); $3,395 (backlit)
Availability: Chevco

Executive Partner (FT-70)

Manufacturer: Panasonic
Op. System(s): MS-DOS
RAM Memory: 256K, to 640K
Storage: Two floppies, 5 1/4"
Display: Gas plasma, hi-res, 11"
Weight: 13 kgs. (29 lbs.)
Software Inc: MS-DOS, BASIC
Features: Built-in thermal or thermal transfer printer; parallel, serial ports standard
Price: $3,995.00
Availability: Panasonic

Compaq Portable II (models 1-4)

Manufacturer: Compaq
Op. System(s): MS-DOS
RAM Memory: 256K, to 2.1 Mb
Storage: One floppy 360K; 20 Mb HD (model 4)
Display: 9" mono., dual-mode
Weight: 24 lbs., (26 lbs. model 4)
Price: $5,799 ($8,149 model 4)
Availability: Compaq dealers

Almost Free PC Software

Volume IX

The premise that good software ought to be cheap isn't one that the microcomputer industry as a whole seems to embrace, what with most programs costing several hundreds of dollars... and usually being copy protected, infested with bugs or poorly documented when you finally do get them. We think that cheap software is almost as fundamental as clean water and classic Coke.

This ninth volume of our popular almost free PC software represents another superb collection of programs for the IBM PC and compatible systems. Whether you're into games, business, hacking or just being in the same room as a microcomputer, this disk will enhance the usefulness of your PC at a cost that won't even dent your wallet, let alone blow it out of the sky as most applications packages can.

Small C If you've ever wanted to try writing programs in the C language, this compiler will fascinate you. It's a restricted implementation of C, producing code which is compatible with Microsoft's MASM and LINK programs... you'll need these to get it going.

Map is an interesting little utility which will check how DOS is situated in the memory of your computer and tell you a number of things about it. It's a useful programming tool, especially helpful if you're debugging software which interacts directly with DOS.

Note is the source file for the memory resident note pad that we ran in the March 1986 edition of Computing Now!. It requires MASM and LINK to use. It will create a resident memo page that you can call up from within any application.

Pango is one of the wildest games we've come across for the PC. While its premise is a bit improbable, it's fast and weird and more fun than a stoned house cat.

PC-Spell is a pretty decent spelling checker written in BASIC. Despite its pedestrian sounding origins, it's fast, accurate and easy to use. It can be listed if you want to see how it works, and comes with a large dictionary file and a utility to assist you in customizing it.

Peacock is a memory resident program which allows you to change the colours of your screen with alternate function keys. It's useful, for example, if you run software which insists on changing the screen to something loathsome.

Recover is a utility to assist you in getting data back from damaged files. It lets you look at your files one sector at a time and put the pieces back together.

SDB is a small relational database. It isn't dBASE III, but it also doesn't cost quite as much. It's still pretty powerful and is eminently suitable for many business applications. It features on line help.

Tally is a program which accurately counts the number of characters, words and lines in a file... all within your lifetime.

Xeno edits the tracks and sectors of your disks in a user friendly format... or, at least, one that doesn't lunge for your throat every time you boot it. You can use it to explore DOS, fix trashed disks, unerase files and do all the other low level magic that sector editors are renowned for.

All of this profound software... plus its attendant documentation and support files... is available for a mere

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plus seven percent Ontario disk tax

from

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1300 Don Mills Road
Toronto, Ontario
M3B 3M8

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Have your Master Card, Visa or American Express card ready.

Fine Print: This software has been collected from public access bulletin boards and is believed to be in the public domain. We have checked this software carefully to insure that it functions as it should. However, we cannot assist you in adapting it to your specific applications.

Moorshead Publications warrants that these programs will be readable when you get them. However, magnetic fields, cosmic rays, truck tires or the bends may adversely affect your disk in transit. If it doesn't function properly when you receive it please contact us for a prompt replacement.

```
0000  43 50 43 20 20 20 20 20 - 45 58 45 20 00 00 00 00    CPC     EXE
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0020  44 49 43 54 49 4F 4E 41 - 20 20 20 20 00 00 00 00    DICTIONA
0030  00 00 00 00 00 00 E5 79 - 00 00 29 00 00 83 00 00          ey )
0040  4D 41 50 20 20 20 20 20 - 43 4F 4D 20 00 00 00 00    MAP     COM
0050  00 00 00 00 00 00 E5 79 - 00 00 4A 00 00 27 00 00          ey J
0060  4D 41 50 20 20 20 20 20 - 44 4F 43 20 00 00 00 00    MAP     DOC
0070  00 00 00 00 00 00 E5 79 - 00 00 54 00 80 85 00 00          ey T
0080  50 41 4E 47 4F 20 20 20 - 45 58 45 20 00 00 00 00    PANGO   EXE
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00B0  00 00 00 00 00 00 E5 79 - 00 00 74 00 00 05 00 00          ey t
00C0  50 43 2D 53 50 45 4C 4C - 44 4F 43 20 00 00 00 00    PC-SPELLDOC
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00E0  50 43 2D 53 50 45 4C 4C - 53 4F 52 20 00 00 00 00    PC-SPELLSOR
00F0  00 00 00 00 00 00 E5 79 - 00 00 7A 00 80 02 00 00          ey z
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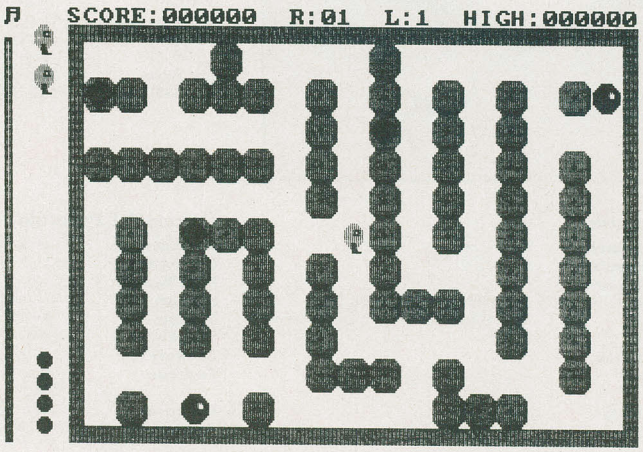
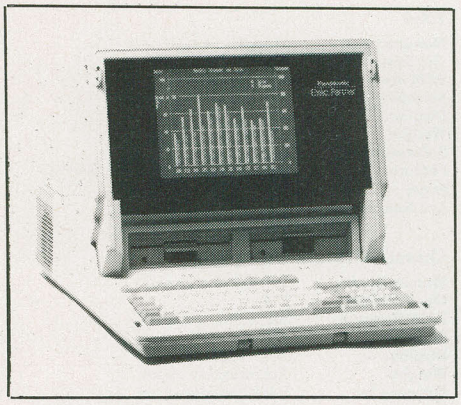
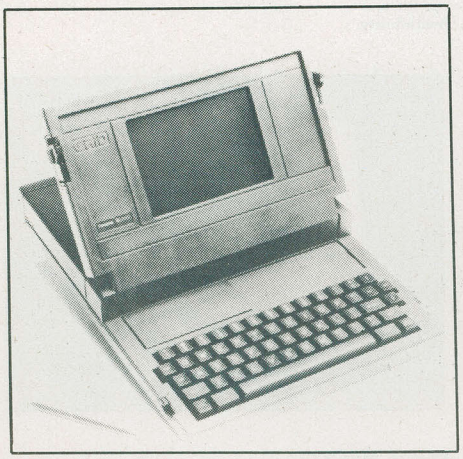


Survey of Portables



GRiDCase 2

Manufacturer: Grid Systems
Op. System(s): MS-DOS
RAM Memory: 128K, to 640K
Storage: Built-in microfloppy, 720K
Display: Battery powered Enhanced LCD, 9.5", 80x25
Weight: Less than 12 lbs.
Features: Four external, four internal ROM slots
Price: $5,085.00
Availability: Grid Systems



GRiDCase 3

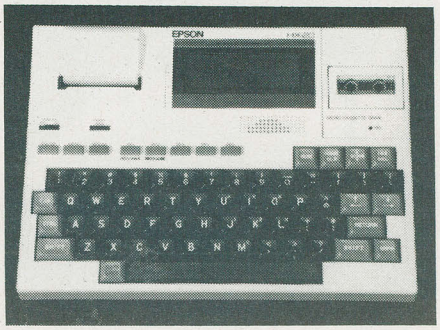
Manufacturer: Grid Systems
Op. System(s): MS-DOS
RAM Memory: 128K, to 640K
Storage: Built-in microfloppy, 720K
Display: Battery powered light-emitting plasma, 9.5", 80x25
Weight: Under 12 lbs.
Features: (see above)
Price: $7,022.00
Availability: Grid Systems

GRiD Compass II (1129/1131/1139)

Manufacturer: Grid Systems
Op. System(s): GRiD-OS, and MS-DOS
RAM Memory: 1131-256K, 1129/39-512K
Storage: Optional floppy or hard disks
Display: 80x25, 8.5" amber EL flat panel (1129-6")
Weight: 10 lbs.
Features: 384K bubble memory; 300/1200 cps modem
Price: $11,614 (1129); $10,969 (1131); $12,906 (1139)
Availability: Grid Systems

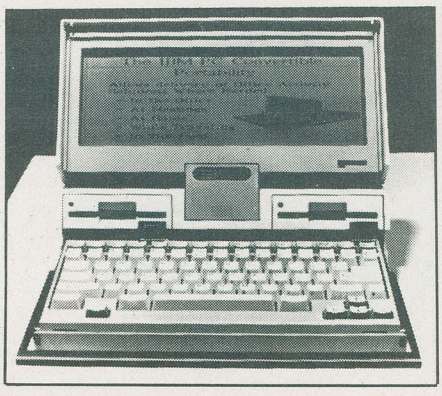
HX-20

Manufacturer: Epson
Op. System(s): CP/M
RAM Memory: 16K, to 32K
Storage: Cassette
Display: LCD, 40x4
Weight: 3 lbs.
Software Inc: SkiWriter w/p; BASIC
Features: Battery powered; 32K ROM, to 64K; built-in printer.
Price: $1,199.00
Availability: Epson Canada



IBM PC Convertible

Manufacturer: IBM
Op. System(s): IBM PC DOS 3.2
RAM Memory: 256K, to 512K
Storage: Two microfloppies, 720K each
Display: Detachable LCD, 80x25
Weight: Less than 13 lbs.
Features: Can convert to desktop display; includes AC adapter
Price: $3,495.00
Availability: Authorized IBM dealers

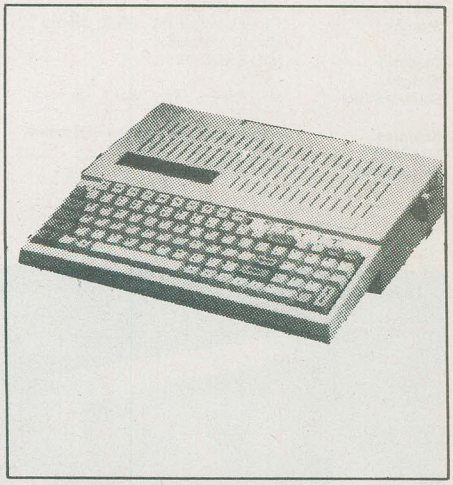


Kaypro 2000

Manufacturer: Kaypro
Op. System(s): MS-DOS
RAM Memory: 768K
Storage: One microfloppy, 720K
Display: LCD, 80x25, mono.
Weight: 11 lbs.
Software Inc: MS-DOS, WordStar, MITE and others
Features: Battery pack, charger; built modularly
Price: $3,499.00
Availability: Coast Computers

Laser 128

Manufacturer: Video Technology
Op. System(s): AppleDOS
RAM Memory: 128K
Storage: One floppy, 5 1/4", Apple compatible
Display: None (cables included); LCD or monitor optional
Weight: 5.3 kgs.
Software Inc: FPBASIC
Features: Compatible with Apple IIc, IIe and II+; runs CP/M; AC adapter
Price: $789.95
Availability: ABaC Electronic Enterprises



M-21 Transportable

Manufacturer: Olivetti
Op. System(s): MS-DOS or C-DOS
RAM Memory: 256K, to 640K
Storage: Two floppies, 5 1/4", 360K; or one floppy with 10-20 Mb HD optional
Display: 9" amber, 80x25
Weight: 29 lbs. (14 kg.)
Software Inc: MS-DOS, GWBASIC
Features: Supports IBM extended graphics mode; carrying case
Price: About $4,300
Availability: Olivetti dealers

Survey of Portables

Pied Piper

Manufacturer:	Semi-Tech
Op. System(s):	CP/M
RAM Memory:	64K
Storage:	One floppy, 5 1/4", 740K; second optional
Display:	None (composite monitor may be added)
Weight:	12.5 lbs.
Software Inc:	CP/M, Perfect software
Features:	Can read other CP/M disk formats; parallel port included
Price:	$706.00
Availability:	Semi-Tech

Pivot II

Manufacturer:	Pivot Computer Corp.
Op. System(s):	MS-DOS
RAM Memory:	320K, to 640K
Storage:	Two floppies, 5 1/4", 360K; internal 20 Mb HD available
Display:	LCD, backlit, 80x25
Weight:	13 lbs.
Software Inc:	MS-DOS 2.11, New Word; telecomm. in ROM
Features:	modem optional; battery based system
List Price:	$3,444.00
Availability:	SVG Marketing

Portable PC

Manufacturer:	Hewlett-Packard
Op. System(s):	MS-DOS 2.11
RAM Memory:	272K
Storage:	384K ROM, portable disk drive optional
Display:	LCD, 80x16, 128x480 bit-mapped graphics
Weight:	8.5 lbs.
Software Inc:	MS-DOS, P.A.M., Lotus 1-2-3, MemoMaker
Features:	IBM file compatible; rechargeable batteries; 300 bps modem
Price:	$5,193
Availability:	Hewlett-Packard

Portable Plus

Manufacturer:	Hewlett-Packard
Op. System(s):	MS-DOS 2.11
RAM Memory:	256K or 512K, to 1.28 Mb.
Storage:	ROM cartridges
Display:	LCD, enhanced contrast, 80x25
Weight:	9.5 lbs.
Software Inc:	MS-DOS, P.A.M., terminal program in ROM
Features:	IBM file compatible; electronic disk
Price:	$4,795 (256K), $6,048 (512K)
Availability:	Hewlett-Packard

Pro-Lite

Manufacturer:	Texas Instruments
Op. System(s):	MS-DOS
RAM Memory:	256K, to 768K
Storage:	One microfloppy; second optional
Display:	LCD, backlit, 640x200
Weight:	10.5 lbs.
Features:	PC interface cable
Price:	$2,995.00 US
Availability:	Texas Instruments

PX-4

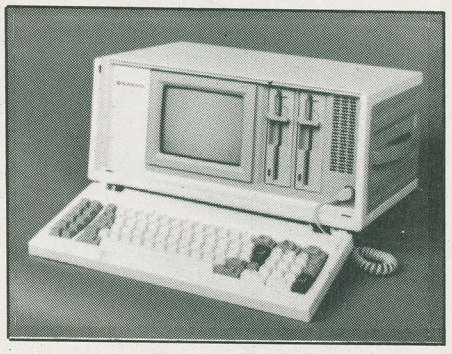
Manufacturer:	Epson
Op. System(s):	CP/M
RAM Memory:	64K, to 128K
Storage:	Microcassette cartridge
Display:	LCD, 40x8
Weight:	About 3 lbs.
Software Inc:	BASIC
Features:	Battery powered; cartridge interface
Price:	Call for price
Availability:	Epson Canada

Quest Wireless Computer

Manufacturer:	Nelma Information
Op. System(s):	N/A
RAM Memory:	8K, to 96K
Storage:	N/A
Display:	LCD, 40x8
Weight:	Approximately 10 lbs.
Software Inc:	BASIC, w/p. telecomm.
Features:	Uses packet radio techniques, ESTeem wireless modem; operating radius one mile; 24 independent operating channels; non-volatile memory; choice of antenna
Price:	$3,395.00
Availability:	Nelma

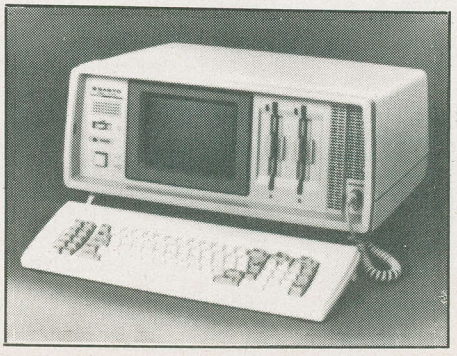
Sanyo MBC665

Manufacturer:	Sanyo
Op. System(s):	MS-DOS
RAM Memory:	256K, to 640K
Storage:	Two floppies, 5 1/4", 360K
Display:	CRT, mono. 7"
Weight:	32 lbs. (14.5 kg.)
Software Inc:	MS-DOS, GWBASIC
Features:	Compatible with IBM software
List Price:	$2,799.00
Availability:	Sanyo



Sanyo MBC775

Manufacturer:	Sanyo
Op. System(s):	MS-DOS
RAM Memory:	256K, to 640K
Storage:	Two 5 1/4" floppies, 360K
Display:	CRT, 9", 16 colours, 640x200
Weight:	About 41 lbs.
Software Inc:	MS-DOS, GWBASIC
List Price:	$3,495.00
Availability:	Sanyo



Almost Free PC Software

Volume X

In human terms, the number ten is rather magical. It's the number of digits we have, the number before which everything can be dealt with with one character and the legal drinking age on Baffin island. At least, this is what people say. In computer terms, ten is minor inconvenience, and nothing to get excited about. The real party starts at sixteen.

In a software sense, ten is rather special as it's the number we've assigned to a decidedly better than splendid collection of public domain programs for the IBM PC. This stuff is supremely special, as befits a number of such obvious significance. While the actual number of programs on this disk is rather smaller than in the past, the programs themselves are rather larger and more sophisticated. They'll blow the socks clear off your computer if you've left any on top of it, and make you forget about data base management, spreadsheets and all the other pedestrian nonsense that usually lives on disks.

It's software so good that anyone else would have copy protected it.

Monopoly is the first working implementation of the classic board game that we've come across... and we've had several that bombed pretty colourfully. This one is great, though, with fast and occasionally sarcastic play, a graphic board display and pretty good sound effects.

D20 is the latest version of Steve's sorted directory program. This one uses DOS two calls and handles subdirectories.

Edit is largely what it says, a public domain text editor. Once again, we've had to dig through quite a few efforts along these lines to find one that didn't crash and burn every time someone had the audacity to sneeze in the same room as it. This is a lightning fast full screen editor, ideal for editing program source files, dBASE stuff or other ASCII phenomena.

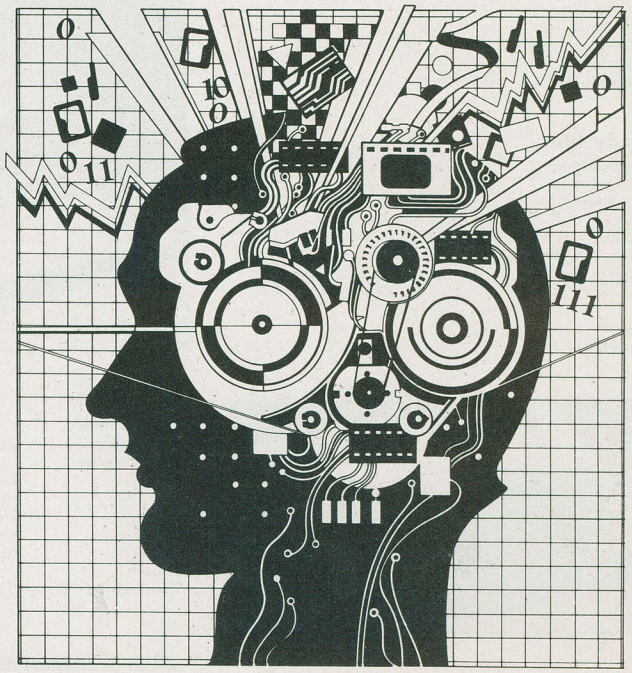
Banner takes mere text and prints it sideways on your printer... in gargantuan block letters that can be read from miles away if you have a good set of binoculars. It's not the sort of thing that you'd want to publish a book with, but it's a good trip for signs.

Mortgage is another utility to help you understand just what you've gotten yourself into. It's one of the nicest mortgage programs we've seen so far... lifelong debt and ruination has never been so well formatted.

Quick speeds up your PC quite a bit. It hooks into the video and makes it run a great deal faster, eliminating at least some of the glacial slowness that makes an IBM what it is.

Speech is a rather remarkable little germ of code. It talks through the PC's internal squeaker speaker. The voice quality isn't exactly human, but it's understandable on most machines. This is a really interesting bit of work, one that can be accessed from within other programs to create talking applications. It's great if the tube in your monitor burns out.

PC-AR is an accounts receiveable package for the PC. While not the equal of some of the commercial software that handles this function, it will take care of the records for a small or medium sized business quite well.



All of this profound software... plus its attendant documentation and support files... is available for a mere

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Toronto, Ontario
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Have your Mastercard, Visa American Express card ready.

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Survey of Portables

STM PC Portable

Manufacturer: Semi-Tech
Op. System(s): MS-DOS, or PC-DOS
RAM Memory: 256K, to 512K
Storage: Two floppies, 5 1/4", 720K
Display: LCD, 80x25
Weight: 17 lbs.
Software Inc: Op. system
Features: Reads IBM disks
Price: $2,100.00
Availability: Semi-Tech Micro

Senior Partner

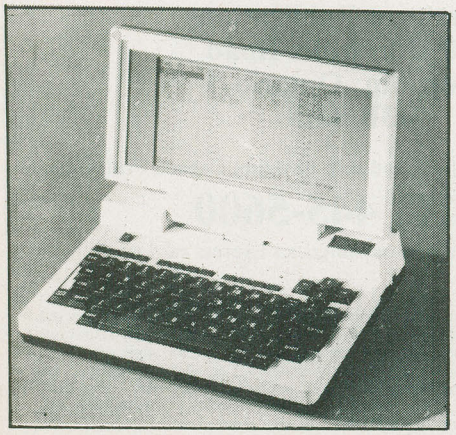
Manufacturer: Panasonic
Op. System(s): MS-DOS
RAM Memory: 256K, to 640K
Storage: Two floppies, 5 1/4", DSDD
Display: 9" monitor, RGB output
Weight: 32 lbs.
Software Inc: MS-DOS, BASIC
Features: Integrated thermal printer; ports
Price: $2,795.00
Availability: Panasonic

Tandy 102

Manufacturer: Tandy/Radio Shack
Op. System(s): CMOS
RAM Memory: 24K, to 32K
Storage: Non-volatile RAM disk
Display: LCD, 40x8
Weight: 2.9 lbs.(w/o batteries)
Software Inc: BASIC, text editer, telecomm.
Features: Built-in rechargeable batteries, 300 bp modem
Price: $799.00
Availability: Radio Shack Computer Stores

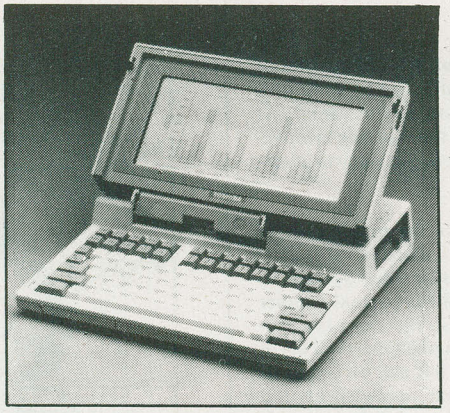
Tandy 200

Manufacturer: Tandy/Radio Shack
Op. System(s): CMOS
RAM Memory: 24K, to 72K
Storage: Non-volatile RAM disk; disk drive optional
Display: LCD, 16x40
Weight: 4.3 lbs. (w/o batteries)
Software Inc: BASIC, Multiplan, text editing, telecomm.
Features: Built-in rechargeable batteries; 300 bps modem
Price: $1,199.00
Availability: Radio Shack Computer Stores



T1100

Manufacturer: Toshiba
Op. System(s): MS-DOS 2.11
RAM Memory: 512K
Storage: Built-in microfloppy, 720K; others optional
Display: LCD, 9.5"x4", 80x25; graphics 640x200
Weight: 9 lbs.
Software Inc: Ready!
Features: Optional 300bps modem board; PCLink opt.
Price: $3,195.00
Availability: Genamation



TI Portable

Manufacturer: Texas Instruments
Op. System(s): MS-DOS
RAM Memory: 128K, to 768K
Storage: One floppy, 5 1/4", 360K; second optional
Display: 9" mono. or colour, 720x300
Weight: 30 lbs.
Features: Parallel port
Price: $2,795.00 US
Availability: Texas Instruments

Z-138 Transportable PC

Manufacturer: Zenith Data Systems
Op. System(s): MS-DOS
RAM Memory: 256K, to 640K
Storage: Two floppies, 5 1/4", DSDD
Display: CRT 7" amber, 80x25, 640x200 dots
Weight: 24 lbs.
Features: IBM PC compatible; 8 Mhz.
Price: Call for price
Availability: Zenith Data Systems

Z-160 PC Portable (21/52)

Manufacturer: Zenith Data Systems
Op. System(s): MS-DOS
RAM Memory: 128K (21), 320K (52)
Storage: One (21) or two (52) floppies, 5 1/4"
Display: Integral 9" amber,with business graphics
Weight: 39 lbs. (21), 42 lbs. (52)
Features: Serial and parallel ports; memory expansion to 640K
Price: Call for prices
Availability: Zenith Data Systems

Z-171 Portable Personal Computer

Manufacturer: Zenith Data Systems
Op. System(s): MS-DOS
RAM Memory: 256K, to 640K
Storage: Two floppies 5 1/4" 360K
Display: LCD, backlit, 10", 80x25, graphics 640x200
Weight: 14 lbs. (6.5 kgs.)
Software Inc: Work scheduler, calendar, clock in ROM
Features: Serial, parallel ports; 16-bit processor
Price: Call for price
Availability: Zenith Data Systems

Sources for Portable Computers

● ABaC Electronic Enterprises, P.O. Box 662, Thunder Bay, Ontario P7C 4W6, (807) 623-6111 ● Coast Computers, 908 West Seventh Avenue, Vancouver, British Columbia V5Z 1C3, (604) 736-5039 ● Compaq Canada, 895 Don Mills Road, Don Mills, Ontario M3C 1W3, (416) 449-8741 ● Data General, 2155 Leanne Boulevard, Mississauga, Ontario L5K 2L8, (416) 823-7830 ● Ericsson Communications, 1799 Argentia Road, Mississauga, Ontario L5N 3B1, (416) 821-9420 ● Genamation, 351 Steelcase Road West, Markham, Ontario L3R 3W1, (416) 475-9434 ● Grid Systems Canada, 2 Park Centre, 110-895 Don Mills Road, Don Mills, Ontario M3C 1W3, (416) 446-1555 ● Hewlett-Packard, for nearest dealer in Canada call 1-800-387-3867 ● IBM Canada, Product Sales, 350 Steeles Avenue East, Markham, Ontario L3R 2Z1, (416) 443-6305 ● NCI Nielsen Computers, 275 Lancaster Street West, Kitchener, Ontario N2H 4V2, (519) 743-1830 ● Nelma Information, 5170-A Timberlea Blvd., Mississauga, Ontario L4W 2S5, (416) 624-0334 ● Olivetti Canada, Dealers Division, 3190 Steeles Avenue East, Markham, Ontario L3R 1G9, (416) 477-8250 ● Panasonic, Matsushita Electric of Canada, 5770 Ambler Drive, Mississauga, Ontario L4W 2T3, (416) 624-5010 ● Sanyo Canada, 50 Beth Nealson Drive, Toronto, Ontario M4H 1M6, (416) 421-8344 ● Semi-Tech Microelectronics, 390 Steelcase Road East, Markham, Ontario L3R 1G2, (416) 475-2670 ● SGV Marketing, 1520 Trinity Drive, Unit 16, Mississauga, Ontario L5T 1T6. (416) 673-2323 ● Tandy/Radio Shack, Radio Shack Computer Stores, various locations ● Texas Instruments, 280 Centre Street East, Richmond Hill, Ontario L4C 1B1, (416) 884-9181 ● Xerox Stores, for nearest location in Canada or direct dealers call (416)429-6750 ● Zenith Data Systems, 1020 Islington Avenue, Toronto, Ontario M8Z 5X5, (416) 232-2686

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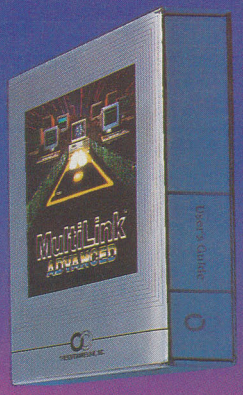

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A Gentleman's Guide to LANs

The almost constant state of flux in business local area networks may have left you a bit dazed and confused. Here's a rock to cling to.

by Donald Roy

The time has come for many potential local area network users to jump off the fence. Not that the time is necessarily right, mind you, but it is here. In spite of continuing confusion and the lack of an emerging standard in local area networks, many have decided to make a commitment to implementing LANs in a business setting.

To those that have resisted the technological sirens until this point, there is good reason. Differing technologies, each having their own drawbacks, have acted to transform what was a very long list of potential benefits into an issue with the clarity of the Detroit river. Many who have managed to clear the hurdle of productively handling micro terminology find themselves faced with an entirely new vocabulary to master, understand and finally to make some judgements about.

Declining hardware prices are improving the potential of office LANs, but in all probability, this was never really the deciding factor. There are a few issues to consider beyond just which manufacturer's boards you will ultimately lay down the cash for. Finding out that cabling the building for the LAN technology you selected is going to cost several times what it would if another type were chosen is the sort of reality that promotes undying paranoia when the subject is broached at managers' meetings.

In the pages that follow, we'll explore several of the more general issues that have acted to make this so. If you are hoping to see the ultimate answer at the end, I'll give it to you now.

It depends.

Break Dancing In The Minefield

Connecting several micros and peripherals together in some cohesive form offers a distinct advantage over a more classical multi-user arrangement. The concept of distributed intelligence is often associated with LANs by the data processing types in a company. In reality, it is a safety net for the failure of a single processor, which would crash all the parties in a multi-user system. While the failure of the central server in a LAN would certainly be inconvenient, most workstations would be able to continue operating in stand alone fashion while the ambulance is being summoned.

Both approaches offer the same potential in terms of such things as sharing files and expensive peripherals, which can be advantageous when working on interdepen-

dent tasks like accounting or complex projects. The concurrency of updated data means that everyone is working from the same information base.

In spite of an overwhelming number of LAN packages available today, each can be simplified into a three or four layered black box. Each layer, then, tends to be handled by only about three different types of technology. At the lowest layer are the physical medium and technique of transmission. Above this lies the logical arrangement of the workstations in the system... the "topology". The third layer comprises the methods used to resolve conflicts that arise when more than one user needs the services of a particular resource at any given time.

A higher level may or may not be provided, according to the particular manufacturer or model of the system. To be found at this height would be particular services, such as data encryption, protocol conversion and network management facilities. In truth, most of the confusion stems from the particular choices and technologies to be found in the first three layers. Differing versions of the last one can be added to all the permutations, regardless of their layouts.

Tackling the most basic issue first, one rapidly becomes enmeshed in optimizing the economic and technical realities. At the root of it all is the cable by which one will make the connections between all of the devices included in the LAN. In choosing between twisted pair, coaxial cable and fibre optic cable... these being the three available transmission media... there are a number of situation dependent factors to consider. The least expensive transmission cable, the twisted pair, is found most suitable for small networks of PCs that are within a few hundred feet of each other. Longer distances can be accommodated by adding repeaters in the lines... essentially small amplifiers.

Being prone to noise interference from other electrical sources, twisted pair cable is inherently limited both in distance and transmission rate, which generally can run to about one megabit per second. Such interference is seldom a problem in the original task to which this type of cable was applied... telephone lines... but the more precise requirements of digital signals restrict its application without shielding, which then increases the cost.

Coaxial cable, typically seen in video equipment connections, reduces the sensitivity to noise, but at a cost. The coaxial structure is inherently self-shielding, but more costly to manufacture. Two different types of cable are used, according to the transmission technique desired, these being "broadband" and "baseband". The former supports many signals at the same time, each having their own carrier frequency. The latter carries one signal at any given instant, though many can be handled in real time by multiplexing techniques.

Baseband transmission is digital in nature, so the associated support hardware remains relatively simple. Broadband signals are analogue and require radio frequency modems at each node in the network. However, the broadband approach allows higher transmission speed and is capable of carrying voice, data and video signals.

The third method of stringing the whole affair together can be found through the high technology of fibre optic cabling. Immunity to electrical noise of any kind is one reason that this offers the greatest potential for future installations, along with extremely high transmission rates. Moving data along at fifty megabits per second may not be an absolute necessity when splitting a hard disk between word processors, but it becomes more desirable if one trying to share real time graphic images among high resolution CAD workstations.

While the attendant cable cost is high today, this may decline in absolute terms as

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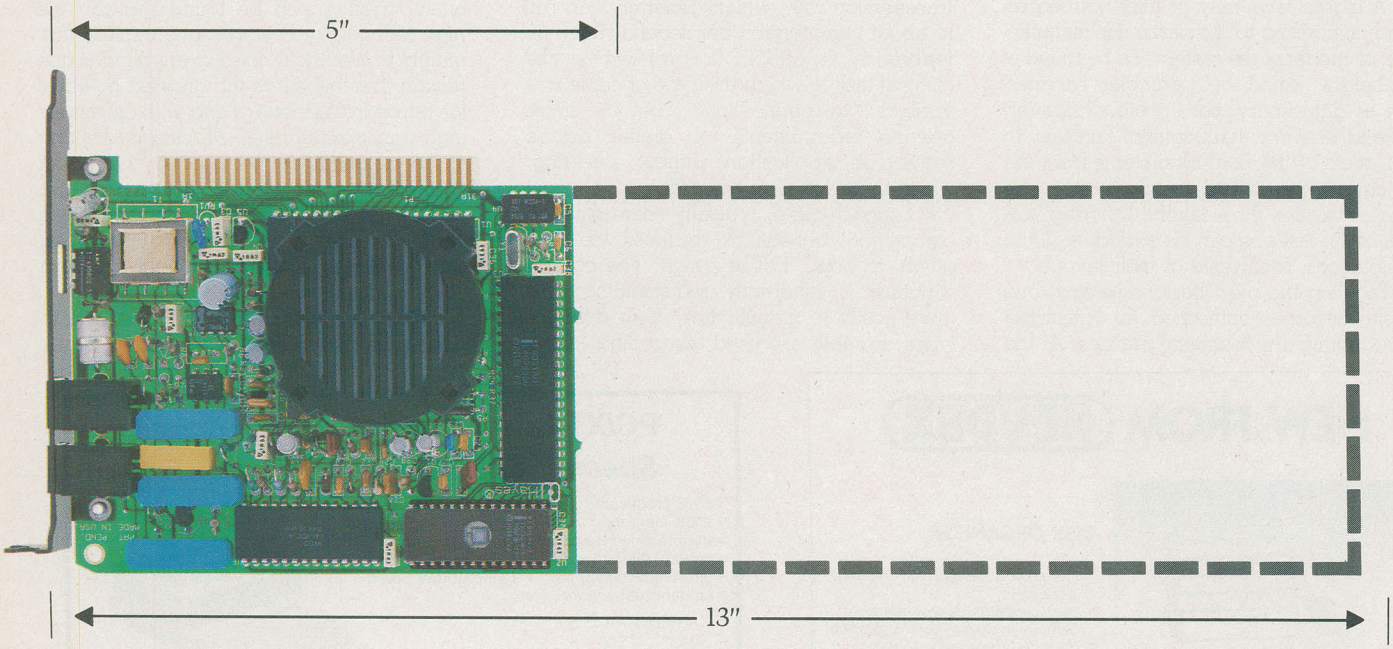

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Say yes to the future

fibre optic production increases and in relative terms as copper supplies become more scarce. Tapping into a fibre network is more difficult than, say, on a twisted pair network. This feature lends itself to uses that must be secure from eavesdropping. While maintenance is minimal for a fibre optic network, the cost of making an allowed connection is high and black tape just isn't on when trying to splice ends together.

OutLANdish

The arrangement of stations in a local area network provides a further source of consternation, affecting such things as individual station response times, the relation of the number of stations to how much work can actually be done, the overall reliability of the system and the fundamental workability of the arrangement. Called the network topology, again three main types are evident. These are the linear bus, ring and star configurations.

The linear bus is essentially a long cable into which any station can be tapped. Working rather like a pipeline, it can be extended on at least one end. A minor conceptual variation is found in the tree arrangement, where the cable can branch at one or both ends, but in which each station still has only one transmission route to any other. All broadband networks and a good number of baseband implementations use either the linear bus or tree approaches.

A ring network forms a closed circle among all workstations, with any signals passing through all points and eventually returning to their source. If one station works to control the communications, the arrangement is called a loop network. Like old strings of Christmas tree lights, if one of the stations happens to burn a fuse, or someone axes the cable, the whole system takes a holiday until corrective actions are in place.

The remaining alternative is the star topology, not implying a preferred status, but that the arrangement is found with all workstations connected to a master controller by individual cables. All communications between stations must first pass through the master computer and are then relayed to their intended destinations.

Of course, each system has its particular set of positive and less desirable points. In terms of reliability, the major point of the ring network has already been mentioned. With a linear bus, the failure of a single station has little effect on the others. Even if rodents decide to have lunch on the cable itself, only the downstream units will notice the effect. In a star, the failure of the master controller is sufficient to send the whole affair into a skid, but a similar fate for any other station is cause for only a minor panic.

Much concentration is to be spent on the question of system performance and how it changes as more users, or devices, are added. This, however, cannot be fruitfully discussed without a basic understanding of how a local area network will decide whether or not a station can transmit on the line. After all, this is what it's all about. The third layer of the black box is the particular access method employed in the system. Frankly, it isn't an issue at all in star networks, since stations each have dedicated lines to the controller.

The others must get quite picky about who can send signals at what time, since linear bus and ring groups work over common cabling. LANs generally use distributed control over access, which is reasonable since each transmitting station has its own processor that can be used to figure things out. The two broad types of control are labelled as "random access" and "deterministic".

In the random access approach, the most favoured system to date is the carrier sense multiple access method, where each station has the ability to listen to the line for current traffic. When data needs to be sent, it will wait until the line is clear and then begin transmitting. If the line is busy, the machine waits for a random time period and then checks again. One of the flies in this ointment is the possibility that two stations detect a clear line and jump on board at the same time. To sort out this potential, some systems implement collision detection routines that allow participants to detect simultaneous transmissions and call a halt until the air clears. Since electrical interference and data collisions are difficult to tell apart, the approach is not too reliable on twisted pair networks.

Deterministic access methods require that each station follow a protocol in sending data. The most widely used is the token passing approach, which is rather like circulating the key to the city among participants. When the token, a unique bit pattern, is received by a station, that one may initiate any needed communication with any other point in the network.

Once finished, the token is passed on to the next point in the line. No further communication may occur until the token is received again. A slight variation on the theme is known as slotted access, which operates as a token passing network but also limits the amount of data that may be sent at any one time.

Putting It All Together

Combining the logical arrangement of stations with the vagaries of access methods, strengths and weaknesses begin to emerge. In a token bus network, the overall system performance will tend to degrade as more users are added. It will take longer to pass the token around to each point in the chain, but the potential of data collisions is avoided, implying its suitability when high accuracy is needed. A bus network may use any of the cable types mentioned, so the transmission rate can be adjusted to fit your wallet size.

A random access bus is best utilized when varied types of traffic are observed between the equipment sharing the line. Mixing tasks that require long, infrequent communication with those operating in short bursts will be found best. The performance of such a network will still suffer as more stations are added and the effectiveness of collision detection circuitry will become critical. The physical area over which the network is distributed can impact the data reliability, since signals will stay on the wire for longer periods of time.

In ring networks, the waiting time between transmissions is set by the number of stations in the ring. Random access rings are seldom found and the slotted access method is unique to the ring idea. Overall system performance will drop off as more users are added. In general, ring networks are most suited to conditions where constant traffic, in terms of frequency and duration, is expected.

While eliminating the complexity of access methods, the star network is entirely dependent on the capability of the master station. To some degree, this can be assisted in large networks, since any slave unit can also be a master for others. A large investment in a capable master computer may not be justified for a very small number of users, since the master is most often dedicated to the co-ordination task.

The highest level of LAN services are those that look after protocol conversion... necessary when connecting devices, or LANs, that don't speak the same language... data encryption, file conversion and network management. These in essence may be added on to most any of the permutations discussed. Here, the specific requirements of existing hardware must be considered, as well as the cost of scrapping some of it for a simpler system.

Finally, not every situation involving multiple devices calls for the use of a local area network to solve the resulting problems. Since every person in an office does not necessarily need a PC on his or her desk, small multi-user systems can suffice in some situations. A shared processor can often do a remarkably good job, if one can balance its resource demands among hardware of similar type and operating system. Software LANs may be entirely adequate where the need for file and resource sharing is more for convenience and most of the intensive calculation is done on individual units.

Very large and complex requirements, combining terminals, micros, larger computers and the inevitable telephone system may be more suitably handled by biting the bullet on a digital PBX which allows both voice and data to be sent over the same lines.

CN!

IBM PC Convertible Review

This latest PC from IBM is another attempt at engaging the interest of mobile users.

by Frank Lenk

The biggest problem with the new IBM PC Convertible turned out to be getting hold of one. The machine was announced early in April but wasn't to make an official Canadian debut until the end of May.

However, perseverance occasionally pays off. I tracked the elusive little blue dickens to a local trade show, organized by Computerland. There I found the IBM display literally littered with specimens of this rare new mutant genus, the PC Convertible. This prize turned out to be well worth the hunt. The Convertible is an amazing beast.

Getting The Top Down

Imagine, if you will, every single feature you could possibly want in a laptop computer. You'll have come up with a frighteningly accurate picture of the IBM PC Convertible. This machine may mark a bit of a departure from recent market trends. IBM has remained the pace setter on PC architectures, its upgrades of the original PC... the XT and subsequently the AT... having been instantly seized upon by the rest of the computing world. Seized upon and cloned, improved and refined... to the point that IBM has reportedly been holding only about half the market in the AT type machines. The genuine, true blue boxes are up against tough competition from machines that are usually cheaper and occasionally superior mechanically.

The IBM Convertible takes a new tack. It introduces no architectural refinements at all. In fact, it is supposed to be one hundred percent PC compatible. Mechanically, however, the Convertible is refined enough to be a formidable contender for top rank in the laptop market.

It's hard to stand out much in a field where compatibility... fitting in... is the first rule. The Convertible shines simply by virtue of its overall elegance. It has the best of everything.

About its most impressive achievement is the inclusion of not one but two microfloppy disk drives... this in a box very little bigger than those of machines that contain no drives at all. The two Convertible drives are tucked under the hood just above the keyboard. Opening up the screen actually clam shells the entire case slightly, lifting the drive slots up just enough to make them easily accessible above the keys. Each drive is double sided, double density, holding seven hundred and twenty kilobytes, or double the capacity of the standard PC five and a quarter inch disk drive. In this way, at least, the Convertible is actually superior to the desktop PC.

The three and a half inch microfloppy is not exactly standard in the PC world. However, IBM is prepared to sell you an outboard microfloppy drive that you can hook up to your desktop machine, providing effortless file transfer to your laptop. Furthermore, you may rest assured that all the big name software will be available on microfloppy format.

The Convertible's RAM capacity is what you'd expect of any PC compatible: a standard quarter megabyte, expandable to a half megabyte in two increments of a hundred and twenty-eight kilobytes.

The battery power is said to be good for about six to ten hours, or only about a third to a half as long as a machine without disk drives. This seems to be a reasonably fair trade. The system includes an automatic power down, shutting itself off after five minutes of disuse. The delay is user adjustable. Alternatively, the user can specify that only the liquid crystal display should be shut off. Either way, at the touch of any key you can return to where you left off. Several optional types of battery chargers will be available, including one that will be able to plug into a car cigarette lighter.

The Convertible display screen is the usual eighty by twenty-four character LCD

panel. This is one aspect in which the Convertible manages to be merely average, eschewing the more futuristic plasma panels found on the most exotic portables. Even so, IBM's effort has a trick or two up its sleeve. The LCD panel can be unplugged entirely, leaving room to balance a nine inch monochrome or thirteen inch colour monitor above the computer. These two special monitors make the convertible look much like the Apple //c. If you want to use a standard composite or RGB tube you will be able to do it, but you'll have to get the optional display adapter expansion. This seems to be the justification for the *Convertible* sobriquet. The machine is almost equally well suited to travel or desktop use.

The Convertible keyboard is one of the highlights of the tour. It offers an extremely nice feel coupled with a moderately decent layout. The typewriter area is quite standard, with only one annoying exception. The *Caps Lock* key has unaccountably been placed where the *control* key belongs, while that key has in turn been moved down below the left hand shift key. I suppose one could get used to this oddity, especially since all the *shift* type keys are a good size and should be easy to hit with your eyes closed. *Return* is particularly large... a nice touch. There are two *alt* keys, one at either end of the spacebar.

The function keys are PC standard, but chicklet sized and arrayed across the top of the keyboard. Special purpose keys like *scroll lock*, *ins* and *del* are aligned at the right hand end of the function key row. A little extra *fn* key is used to access some of the more obscure functions... such as *pause* and *break*... as well as to enable the numeric pad that is superimposed on the right hand typewriter keys.

The cursors are assigned to their own handy little T shaped pad at the lower right. The chicklet size of these and the function keys should present no difficulties, and the location of the cursors looks particularly attractive.

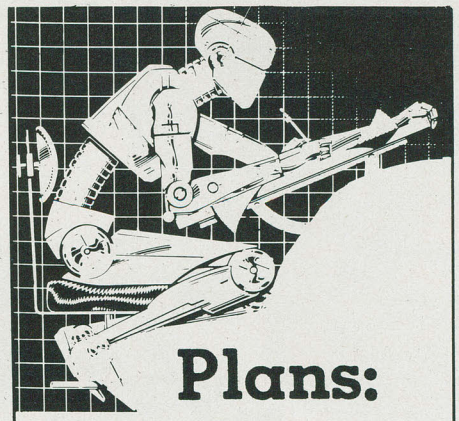
Software, in addition to DOS, includes the inevitable desktop management stuff. There's an icon based application manager that lets you access eighteen programs plus the system utilities *tools* and *help*. There are also the obvious executive tools, note writer, schedule, phone list and calculator. As a bonus, you get good old BASICA in ROM.

An optional thermal printer snaps onto the back of the computer. Its print quality in the normal mode looks excellent, and it's only slightly worse in the special impact printing mode.

The Price Of Victory

Considering how good all this stuff sounds, you just know there has to be a price. There is, and it ain't cheap.

The basic Convertible will be selling for about thirty-five hundred dollars Canadian... or about thirty dollars less without those wonderful little desktop utility programs.



Plans:

Computer:	**PC Convertible**
Manufacturer:	**IBM**
RAM:	**256K, expandable to 512K**
Weight:	**Less than 13 lbs.**
Availability:	**Authorized IBM dealers**
Price:	**$3,495.00**

That's only the beginning. The Convertible is blessed with many nifty options, but every one of them will cost you. Getting your machine up to a half meg of RAM will cost about seven hundred bucks. The thermal printer module goes for a relatively reasonable five hundred and twenty dollars or so. Battery chargers are under fifty dollars.

An internal three and twelve hundred baud modem is available. That'll be almost eight hundred bucks, please. Then you'll almost certainly want some interfacing. An add on module incorporating RS-232 and parallel printer ports will run to about three hundred and fifty dollars. If your appetite is still unsated, you can ponder the expense of extra desktop monitors, outboard microfloppy drives for your PC, and still other wonderful possibilities.

Oh, I almost forgot: you'll want DOS. That's another hundred and forty clams.

Obviously, all this could add up to a very negative cash flow situation for the unwary buyer. Well, you don't always get what you pay for in this world... but you almost inevitably do pay... heavily... for what you get.

Nobody said that the IBM Convertible was going to be the cheapest laptop in the world. However, considering the high quality of the equipment and the sheer quantity of the accessories, it could well be the best.

CN!

The Toshiba T1100 Review

A powerful contender for a spot in your briefcase, the Toshiba is an interesting system.

by Frank Lenk

There's one thing to consider about cramming IBM PCs into boxes the size of the average hardback book. It tends to make them all look pretty much the same. After all, there are just so many ways of getting all the necessary stuff in there. In the end it's the little things that let you tell them apart... how clear the screen appears, how nice the keyboard feels, how much storage the system provides, and so on.

On that kind of basis, the discerning shopper is bound to take a liking to the Toshiba T1100. It looks much the same as the rest, but somehow manages to squeeze just a little more juice into the same crate.

The Good, The Bad And The Ridiculous

Folded up, the Toshiba T1100 looks not unlike the HP Portable or the IBM Convertible... sleek. The only real distinguishing mark on the Toshiba is the presence of a three and a half inch microfloppy drive at the right rear of the box.

As with the HP, opening up the Toshiba is pretty much a two handed effort. I managed to fool the thing, however, by slipping its two side mounted latches separately. There seems to be enough slop in the mechanism that the latches can usually be disengaged one at a time... handy if you'd rather not put down your cup of coffee.

Once more as with the HP, I noticed the glaring absence of any manner of carrying handle. When stripped of their leatherette cases, these machines present an almost featureless plastic oblong... difficult to grip, let alone lift. Manhandling the unit around your office... or whatever... would certainly be a lot easier if some sort of grab handle were provided. While we're wishing, how about a bit of non-skid rubber on the underside. Those little rubber pads are fine on a desk, but after all... this *is* supposed to be a *lap*top.

The Toshiba screen looks externally like the same twenty-five by eighty character display found on virtually every other laptop in creation. However, the Toshiba's picture window is oddly more legible than some of the others, providing slightly better contrast between the black dots and the background. In fact, I found that with the contrast control turned all the way up I could read the Toshiba panel from quite oblique angles.

One interesting feature of these LCD screens is that the horizontal viewing angle seems to be better than the vertical one. Thus, the Toshiba screen stayed quite legible even about sixty degrees to either side, but only thirty degrees vertically was enough to frazzle the eyeballs. The vertical angle is continuously adjustable on the Toshiba, so there should be little difficulty finding a bearable perspective.

Surprisingly, the Toshiba comes with both RGB and composite outputs as standard equipment, and thereby supports your garden variety PC monitors. A little slide switch tells the machine which you're using at the moment. Since the LCD offers all the usual PC video modes... eighty by twenty-five, forty by twenty-five and six hundred and forty by two hundred pixel graphics... I assume the outboard monitor would mimic a desktop PC rather well.

The Toshiba keyboard offers a mix of the good, the bad and the peculiar. The typewriter part fares best, with a robust, healthy feel and intelligent layout. There's no clickstop feedback, but the key springs are firm enough to make this unnecessary. Accessory keys like control, shift and alternate are all where they should be, and oversized to boot. The F and J keys have raised pips to aid the touch typist.

When it comes to its function and cursor keys, however, the Toshiba really blasts off into the wild blue. The function keys are set in two rows of five above the left end of the keyboard. Left to right, the numbering is F9, F7, F5, F3 and F1 in the top row, then F10 and so on in the lower row. This is the standard PC layout turned on its side. Once your fingers catch on this isn't terribly bad.

The placement of the number keys is even stranger. At the top right in two rows,

they read 1, 2, 3, 7, 9, PrtSc, plus and scroll lock. The second row goes 2, 4, 6, 8, 0 and Ins, period and Del, minus and Num Lock. This novel arrangement places the arrow keys as the first four on the bottom row, down, left, right and up. The plus and minus end up above one another, as do scroll and Num Lock. However, end, PgDn, PgUp and home wind up scattered higgildy piggildy. The layout would definitely take some getting used to, though in the end it does seem to have certain advantages.

The Toshiba comes off the rack with a quarter megabyte of RAM. This can be expanded by adding a two hundred and fifty-six kilobyte memory board, giving you a more comfortable half megabyte capacity.

The internal microfloppy drive is a pleasant surprise, being in double sided double density format. It offers you seven hundred and twenty kilobytes of storage at your fingertips. The Toshiba will also take an optional external drive attached to a port built into the back panel. You can get either a second microfloppy or a normal IBM type five and a quarter incher. A slide switch can select either the internal or external drive as logical drive A, which would let you boot your existing PC software from an external five and quarter inch disk. A light set just below the battery indicator on the front panel tells you if the external disk is selected.

The Toshiba runs a very convincing version of MS-DOS 2.11. All the usual DOS stuff seems to work out, although I didn't have the chance to port over any dedicated PC software to put this to the acid test.

Toshiba BIOS looks equally well behaved. It even lets you abort its memory check the same way Phoenix BIOS does.

Any Port In A Swarm

Pretty much all the usual interface goodies are available with the Toshiba, but mostly as optional appendages. You can get the stock items, such as an external floppy drive or an internal RAM expansion card. You can also get a serial connection in one of two ways. The RS-232-C card provides asynchronous communication up to ninety-six hundred baud, and includes a real time clock. The interface cable is optional. Alternatively, you can go for the modem card, which consists of an RS-232-C, a three hundred baud full duplex modem and the inescapable real time clock.

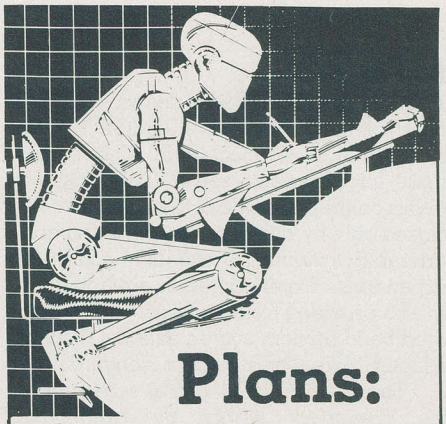
The machine's standard equipment, in addition to the video outputs, consists of two D type connectors... a Centronics parallel printer port and the thirty-seven pin external disk connector.

According to the manual, the Toshiba T1100 is "built on low power consumption CMOS technology" and should run for about eight hours on the built in NiCad batteries. This estimate... it says here... is based on a ten percent duty level for your floppy drive and the absence of the optional RS-232-C card and expansion RAM.

The Toshiba has no equivalent of the Hewlett-Packard's percent power remaining feature. All you get is a little red low battery warning light. This may be a bit like closing the barn door after your cows have all moved on... depending on how much warning you actually get. The Toshiba also lacks the HP's battery saving auto shut off feature, preferring a positive toggle power switch.

On our review machine the light came on after the machine had been sitting idle for two or three hours. However, its operation continued unimpaired at this point.

Toshiba's AC adapter is the usual black brick. Plugging it into the back of the computer during operation had no visible effect on the system, except that the low battery light immediately went out. According to the manual, a full charge should take about eight hours... with the machine switched off during the entire time. No time was specified for charging while the Toshiba was being used, but the manual does note that "charging cannot be expected" while the disk drive is in operation. It also warns that if the battery is run totally dry you should charge for at least five minutes before powering up. The overall battery life is rated as five years... less if you overcharge or leave it discharged for long periods.



Plans:

Computer:	**T1100**
Manufacturer:	**Toshiba**
RAM:	**512K**
Weight:	**9 lbs.**
Availability:	**Genamation, 351 Steelcase Road West, Markham, Ontario L3R 3W1, telephone (416) 475-9434**
Price:	**$3,195.00**

The Diagnosis

It was rather worrying to note that the Toshiba T1100 owner's manual list itself as a system option. On page two there's a heading "Options include" and immediately underneath there's a listing for manual set... which apparently "consists of the MS-DOS Reference Manual and Owner's Manual." If our system hadn't included the owner's manual we'd never have known what we were missing. This is either a bit of imprecise documentation or a considerable limitation of the standard Toshiba configuration. Check with your dealer before leaving the store.

Assuming you've got them, the manuals are a decent little wad of paper. The owner's manual is a coil bound booklet which spends about equal time demonstrating how you plug your system together and how you make MS-DOS do its thing.

The MS-DOS reference manual is nearer an inch thick, hole punched but gummed together in much the same way that tear off desk notepads are. Obviously this binding is meant mainly to keep the sheets neat until you can supply your own three hole... IBM size... binder. The contents are not dressy, but very complete... right down to excellent references on system calls and interrupts and how to write your own device drivers.

In short, the T1100 looks like an excellent all round system. It gives away darn little to the full fledged desktop dinosaur. If you have the money to spend on a briefcase sized computer, the Toshiba is well worth considering. **CN!**

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The Hewlett-Packard Portable Review

Unquestionably one of the best built, and easily among the best supported laptop computers, the HP portable is the system for people with high credit limits.

by Frank Lenk

In the annals of computing, the name Hewlett-Packard has always stood for a top notch... almost esoteric... level of quality. At its introduction, the HP Portable received a large amount of critical acclaim. Now, a year or two down the road, it no longer looks quite as remarkable, but it still holds a strong position in the laptop arena.

The HP Portable Plus is one solid looking box. The screen, for instance, folds out on two massive hinges that recess into the top of the machine like large plastic struts. Except for these hinges and a few tiny connectors on the back, the HP is pretty featureless. In fact, all the features are well hidden away inside the cabinetry.

Considering that toting this box around is what the whole effort was about in the first place, the HP scores rather well with the quality of its carrying case. This is the sort of luggage that any executive could feel proud of, constructed of black leatherette padded with what feels like closed cell urethane foam. The case fits like a glove, and offers both an attache style carrying handle and a detachable shoulder strap.

What the case doesn't have is a lot of extra room inside. By contrast, the case that came with the Toshiba T1100 was bigger, more likely to allow the computer to slop around inside... but capable of engulfing a number of diskettes, pens, papers and the rest of that junk that you miss so badly when its not close to hand.

Sea Moss

According to the official descriptions, the heart of the Portable is a CMOS 80C86 running at 5.33 megahertz. This should make for reasonable speed. Two compartments on the underside of the machine... accessed only by dint of screwdriver and considerable profanity... house RAM and ROM expansions. Expansion areas are apparently also provided for an internal twelve hundred baud modem and an external monitor adapter. A real time clock is standard.

The full size liquid crystal screen does the customary eighty by twenty-five characters of text. Its graphics resolution is a slightly unique four hundred and eighty by two hundred pixels, which would presumably need custom drivers to work with stock software. Characters can be shown as inverse, underlined, blinking, low intensity and any combinations thereof.

Compared to the other laptops I looked at this month, the HP's screen looks relatively faded and lacking in contrast. The difference is subtle, but liquid crystal panels are so hard to read in the first place that every little bit counts. It could be that the sample computer that Hewlett-Packard sent us had simply been knocking around a bit longer than the others.

Those hefty hinges allow the HP screen to tilt to just about any conceivable angle. However, the hinges are quite long in the shank, so that the screen sticks up about an inch more than it really has to. This could be an advantage on the average desk top, or a drawback in really close quarters.

The computer's screen brightness is controlled by a key right on the keyboard, shoe horned in just below the return key. Hitting this brightness key repeatedly will darken the screen, while hitting it together with shift lightens the screen. Of course darkening the image down is futile beyond a certain point, since its contrast remains roughly constant. The backdrop darkens just as quickly as the foreground. Once more, this is a feature common to all liquid crystal screens... at least the ones floating around at this point.

The HP keyboard seems a bit dated by recent laptop standards. The mechanism is solid enough, but the feel is vaguely reminiscent of a desktop calculator or a cheap electric typewriter or something similar. The overall impression is that everybody was so impressed with getting an MS-DOS computer into that little tiny box that they assumed a really fine keyboard would be too much to even hope for. Not that the HP is all that bad, really. It's just not my personal favourite.

The entire keyboard is grey, without the dark to light markings usually provided to set off the function keys from your straight alphanumerics. The lettering is in Hewlett-Packard maroon, which looks nifty. However, looks are skin deep, since the

layout is anything but standard. The escape key is about the worst offender, having meandered off and hidden somewhere down near the left hand shift key. Delete is located by shifting this same key... again, not the first place I'd look. None of the control type keys is particularly large, with the return key particularly lacking in surface area... though not as badly as the original IBM PC carriage return.

The function keys really strike out in a bold new direction. For one thing, there's only eight of the little devils. The first four are split from the latter four by a pair of contrasting keys marked *menu* and *user system*. Most of the HP software puts a set of labels across the bottom of the screen, just above these keys.

The cursor keys are set in a row at the upper right. The numeric pad is superimposed on the right end letter keys.

The HP shows its age somewhat in its lack of any internal disk drives. This is certainly a hefty limitation in my estimation, although the Portable does have some interesting ways of getting around the problem. The system is designed around something called the *Edisc*... electronic disk.

The Edisc is functionally similar to your regular, run of the mill RAM disk, but with one important additional capability. It uses battery power to maintain the disk's contents, even while the HP is switched off. A configuration program... of which more anon... lets you partition the available RAM between the Edisc and normal DOS program space. With the standard hundred and twenty-eight kilobytes of RAM, the Edisc can vary from four to forty-eight kilobytes. Unless you are a very humble sort of user indeed, you'll be wanting to beef up the machine's capacity.

The Edisc shares the speed advantage of RAMdisks. Once your files are in the Edisc, you can access them at RAM speeds. The system's ROM based software is, of course similarly peppy. Lotus came up like a flash on our demonstration machine. HP also points out that the Portable's well known impact resistance is partly due to the absence of a mechanical disk drive.

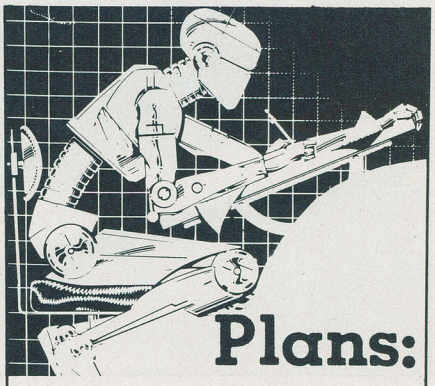
HP gets some extra mileage out of the Edisc idea by adding frills like password protection. Using the command SECURE will cause the HP to ask you for a password the next time it's powered up. Unless you can supply the keyword, the HP will power right back down again. As with any soft password, you can bypass the road block by clearing the RAM... for instance, by hitting the reset button located in the battery compartment at the rear of the computer. However, because the Portable's files are stored entirely in volatile memory, any such safe cracking manoeuver is guaranteed to destroy all the stored data. If you are so foolish as to forget your password you'd better hope you can remember every word of what you had stored.

The ultimate solution to the system's storage and interfacing worries is to splurge for HP's outboard microfloppy drive. This seven hundred and twenty kilobyte drive will add some bulk to your baggage, but could also open up new vistas in computing potential. A computer without a disk drive is like a freight train with no boxcars.

The HP's standard RAM capacity of a hundred and twenty-eight kilobytes is expandable to eight hundred and ninety-six. Its ROM comes stock at a hundred and ninety-two kilobytes, but can be expanded to over three megabytes.

The HP Portable comes with quite an entertaining selection of lightweight software. This includes MS-DOS, naturally, plus a menu operated desktop manager called PAM... the Personal Applications Manager. Then there's HPLINK and TERM communications programs, SECURE, the password protection program, PACK, an Edisc utility and, finally, EDLIN, the DOS line editor.

The proper way of poking software into the HP Portable involves physically poking ROM chips into the "software drawer", one



Plans:

Computer:	**Portable Plus**
Manufacturer:	**Hewlett-Packard**
RAM:	**256K, expandable to 1.28 Mb.**
Weight:	**9.5 lbs.**
Availability:	**Hewlett-Packard dealers**
Price:	**$4,795.00 (for 256K RAM)**

of the two compartments located on the underside of the computer. Unscrewing the cover reveals a mostly bare circuit board, with space for twelve ROM chips. Sockets are paired and marked H and L, to allow for software that needs the extra room. In the machine I played with, for instance, Lotus chips occupied two adjacent sockets. A little pamphlet explains how to shove chips in the sockets without breaking their legs or frying them with static. Personally, I think I'd be tempted to see my dealer for this.

Considering the complications of trying to get software into the HP Portable, it is comforting to note that HP itself has a reasonable selection of it. You can get business standards like Lotus 1-2-3, MultiMate and Microsoft Word on ROMs. If you spring for the outboard disk drive, of course, you'll be in clover. You can even get games... the inevitable Infocom adventures, for instance.

According to the handouts, the HP batteries should have an unusually long operating capacity, running for up to about twenty hours of continuous use. The slow consumption could have a lot to do with the absence of a disk drive. The system memory is supposed to be retained for six months of disuse. However, the machine I used lost all its Edisc contents for no apparent reason on the second day I was playing with it, while its battery capacity was still showing nearly eighty percent.

One nice feature of the HP is that it will automatically power down after several minutes of idleness. This is disconcerting the first time it happens in the middle of a heavy session, but lo and behold, your application comes right back up at the touch of any key, still waiting exactly where you left off.

The HP's battery reserves are continuously displayed on the PAM screen as a percentage of full charge. This level of information is a lot more useful than the simple warning light used on machines like the Toshiba T1100. The only drawback is that, being in software, the indicator can be viewed only when you're in that part of the internal environment. If you're in the midst of some heavy computing and get worried about your power status you'll have to quit in order to reassure yourself.

Non-potable Water

Without a doubt the most incredible feature of the HP Portable is its documentation. This is one case where the paperwork must surely outweigh the actual hardware by a factor of two to one. The computer may be portable. The books are anything but.

The HP manuals occupy four of those ludicrous IBM style boxed binders... about a bookshelf's worth. There's one called simply "owner's documentation". This contains two sections, "using the portable plus", and the "HP 82983A modem owner's manual". Another binder is dubbed "Memo Maker/Time Management", and deals with the HP's built in desktop software. There's one called "PC 2622 Version 3.0", which relates to the machine's fancy terminal software. Finally, my machine came with a fourth book devoted entirely to Lotus 1-2-3, which happened to be installed in ROM.

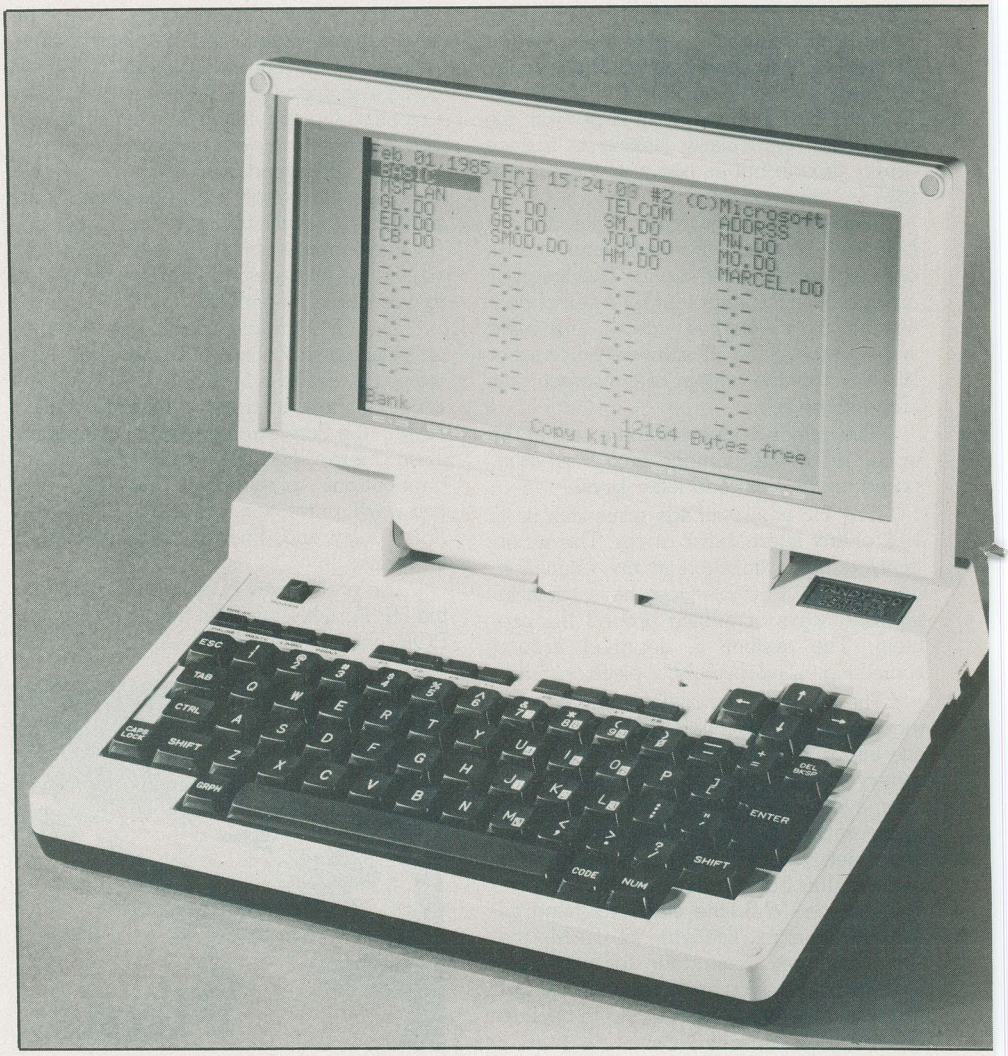
Yet a fifth manual... "Getting Started With the Portable Plus"... had, alas, gone astray some time before I received the system. One can only hope that this missing book was the exception in the series, being printed in a format that wouldn't render a camel paraplegic.

Kinky limitations and all, the Portable Plus is every ounce an HP. That implies a decent level of quality and support. If you happen to agree with some of the design decisions... notably the Edisc... and you happen to have the requisite number of beaver skins, the HP Portable might be the right portable for you. **CN!**

The Tandy 200 Review

Far from being a portable stereo or a radio buried in a fuzzy dog, this bit of paraphernalia from Radio Shack constitutes a moderately powerful portable computer.

by Frank Lenk



The Tandy 200 is one of the cheaper laptop machines that you can come by. It is not surprising, therefore, that it is also one of the cheaper *looking* pieces of plastic in the group. What is surprising, perhaps, is just how little this box gives away, even in its appearance.

Furthermore, you have to take careful note of just where the corners have been cut. Although the Tandy 200 lacks the lush look and feel of some of the luxury machines, it is still a very functional computer. At something of a bargain price, it offers almost all the same features as machines costing several times more. It also comes up with some unique little perks of its own.

For instance, the Tandy 200 is by far the smallest and lightest of the boxes I looked at for this magazine. This has a lot to do with the absence of otherwise useful things, like internal disk drives or huge internal ROM banks. However, it does have an obvious appeal for those whose baggage space is as modest as their computing demands.

The Tandy 200 was also the only one of the review machines that is not MS-DOS compatible. This is not as much of a loss as it might seem. Any machine you buy for the express purpose of slinging it around the country in a briefcase will have only a limited need to be truly compatible with anything in particular. Interfacing is really the only problem, and the Tandy has no problems keeping up in that regard.

Padding It Out

The Tandy screen is quite a bit different from those found on the other machines we looked at this month. Although it looks roughly the same size as the ones sported by the Hewlett-Packard or the Toshiba, the Tandy's view plate is really a forty column affair, with only sixteen vertical lines. As far as I could determine, the screen is not designed to offer pixel addressing, so graphics are not on the bill of fare.

Unfortunately, the limited text resolution has no particular advantage as far as readability is concerned. The size of the letters is less critical than the display contrast. The Tandy screen scores reasonably well on readability, nonetheless. The range of brightness settings and the size of the useful viewing angles is certainly no worse than with any of the pricier units. Display brightness is set using a little thumbwheel set in the right side of the box.

A set of numbers... one through eight... is printed across the bottom of the screen, showing positions on the sixteenth screen line that often correspond to your available function key operations. For instance, in the main menu you can change RAM banks using F1, copy a file between banks using F4, or kill a file using F5. F8 usually takes you back to the main file menu.

The function keys are little chicklet sized doohickeys that don't actually line up with the screen numbering, owing to a bank of four special purpose keys elbowing in from the left. These offer the functions break, paste, label and print screen. The small size

of these keys doesn't really impair their usefulness, but it is puzzling since there's a lot of unused space at the top of the keyboard.

At least the cursor keys are a useful diamond of full size keys, located at the upper right of the keyboard. The power switch is a little square button at the upper left.

The rest of the typewriter keys are laid out in a reassuringly standard manner, although I found the left hand shift key a bit too small and close in for easy typing for someone who's become accustomed to the long pinky reach of an IBM style layout. The control key, fortunately, is in its accustomed position, as are escape, tab, backspace and so on. The return key is a nice big block.

At either end of the space bar there are some special purpose keys. The *grph* key... at the left... is the equivalent of the PC's *alt* key, and is used to enter the alternate graphic character set. The *code* key... at the right... allows entry of foreign language characters. *Num*, located just outboard of *Num*, enables the numeric pad that's superimposed on the left end of the typewriter area.

The numeric pad idea is not a bad one, but I did find one some small cause for complaint in the Tandy implementation. Although the pad area has its keys clearly labelled with both their alpha and numeric values, the math keys are completely unmarked. While in numeric mode you'll find that the normal zero key on the top row becomes the plus key. The P key is the minus, the semicolon is times, and the slash is divide. These four keys run parallel to the right side of the numeric area, but with the exception of the slash... which performs its usual function... none is discernible except by reference to the documentation. One might be tempted to try sticking little markers on the math keys, although why Tandy itself didn't bother is hard to guess.

The overall feel of the Tandy keyboard is pretty awful... about like a toy typewriter. Still, it does serve the purpose. Once you get used to the very flat keytops, you could no doubt bang out any number of novels with no other equipment. I did find that the keyboard benefits greatly from being tilted toward you, the way any decent desktop keyboard would be. Little drop down feet to raise the back of the computer would be a cheap but immeasurably useful addition to the Tandy. As it is, you'll have to rely on whatever objects come to hand for doing your propping up. You won't be able to raise the rear too far in any case, because the limited rearward tilt available on the display screen hinge will start to limit your visibility.

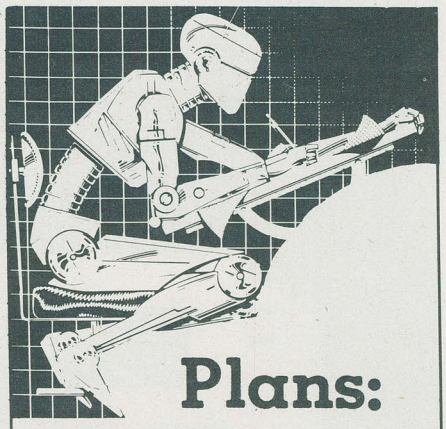
The Tandy 200 is not exactly overburdened with RAM. As it comes out of the box you have just under 20K of file storage available in RAM bank number one. Since most software comes on ROMs, program space isn't really a problem. If you want extra file storage, however, you'll have to purchase some extra banks of RAM. These come in blocks of twenty-four kilobytes each, and you can add up to three of them... for an overall total of seventy-two kilobytes.

Assault And Battery

The Tandy's batteries are rated for fourteen hours of use. A red warning light comes on when you have twenty minutes left. Batteries are normally a set of four replaceable penlights, although rechargeable batteries can be used.

The Tandy 200 uses a peculiar system for maintaining RAM power. A switch on the bottom of the case enables memory power. The manual warns not to off the memory switch and even suggests placing tape over the switch so that it doesn't get knocked off by accident. I'd sure like to know why they bothered putting in a switch that you're never supposed to use. Such mysteries, I suspect, are beyond mortal ken.

Apparently the main batteries maintain a secondary internal battery that actually maintains the machine's RAM. This arrangement would presumably allow you enough time to swap old batteries for new without losing your RAM based files. The manual warns against leaving your machine lying idle for more than five to fifteen days without a fresh set of batteries, lest you end up losing internal things.



Plans:

Computer:	**Tandy 200**
Manufacturer:	**Tandy/Radio Shack**
RAM:	**24K, expandable to 72K**
Weight:	**4.3 lbs.**
Availability:	**Radio Shack Computer Stores**
Price:	**$1,199.00**

The Tandy does have an automatic shut off feature. The default idle time before the machine powers down is ten minutes. This value can be reset by changing an internal string from the built in BASIC. The system time and date can be set by a similar procedure, by the way.

Several pieces of software are built into the stock Tandy 200. You get Microsoft BASIC, the TEXT editor, TELCOM terminal, ADDRSS and SCHEDL management utilities, and Microsoft's Multiplan spreadsheet. This is all reasonably good stuff. Multiplan is, of course, the real name brand star. TEXT is a fairly adequate editor, with search and replace, cut and paste, word-wrap and the other essentials. However, it still baffles me why all laptop makers feel duty bound to build in spreadsheets, and why none of them seem to consider a really excellent word processor to be a better alternative. Do accountants do more computing on the road than writers? Are you more likely to bring your books up to date in a hotel room, or to write a letter home?

One of the most useful built in features of the Tandy is its four function calculator. To enter calculator mode you first have to be in numbers mode... with the *num* key down and locked, thereby enabling the numeric keypad. Then hitting the *grph* key will toggle in and out of the calculator. The top line of the screen clears, with the word "Calculator"displayed at the left and your calculation at the right. The calculator is always available, from inside all the other applications.

The Tandy box is riddled on just about all sides with lots of interfacing holes. The right rear has an external AC adapter input. Across the back you get an RS-232, a forty pin system bus, a Centronics parallel printer port, a modem port, and a cassette port. Although most of the configurations are nice and standard, the connectors mostly are not. The Centronics interface uses a rectangular jack rather than the more usual D type. The modem jack is a DIN type, as is the cassette port. Naturally, Radio Shack will supply all the appropriate connecting hardware and cables, so this shouldn't be much of a problem.

The left rear of the case has yet another port which I discovered is meant to accept input from a bar code reader. Buddha alone knows why.

Oddly enough, the Tandy 200 is accompanied by some of the best documentation we saw with any of the laptops. Three of the manuals are paperback sized, coil bound books covering operation of the computer, Multiplan and the TELCOM terminal program. Another coil bound book... half the size of the other two, and therefor easily pocketable... provides an excellent command reference to the built in BASIC. Last, but not least, you get a thin, palm sized booklet containing a complete quick reference to the computer and all the applications software. What more could you ask?

As a whole, that's probably the operative question when judging this system. If all you want is a lightweight computing device with some functional but not necessarily spectacular pieces of software... what more *could* you ask than a Tandy 200? **CN!**

Resident DOS Tools

DOS isn't much use if you're already ensconced in an application. These programs get around this.

by Donald Roy

Were all of us to have perfect organizational skills, the world would, indeed, be a perfectly boring place. For some, much of our daily recommended dose of excitement comes from suddenly realizing that the file about to be saved is going to overwrite one that should also be kept intact.

It would be just so nice to drop back into DOS for a second to do some file maintenance without having to suffer the inconvenience of exiting the current application. Today, more word processors and other types of software are being built with a DOS interface just for such an eventuality. Older programs, however, can be a bit more cantankerous about this.

For those that have stayed with their old faithfuls, and for users of copy protected software with key disks, there are now a couple of utilities that can relieve this sort of nastiness. Specifically, in this review, we'll have a look at two programs that place many of the functions of DOS into memory, keeping them handy until they're needed.

Tenants

Aside from just duplicating the standard functions of the disk operating system, PC Tools, from Central Point Software, also provides a resident file undelete routine, as well as another that will map disk space usage. Standard things, like diskette formatting, copy and verify files, text searching and file printing are available at your beck and call.

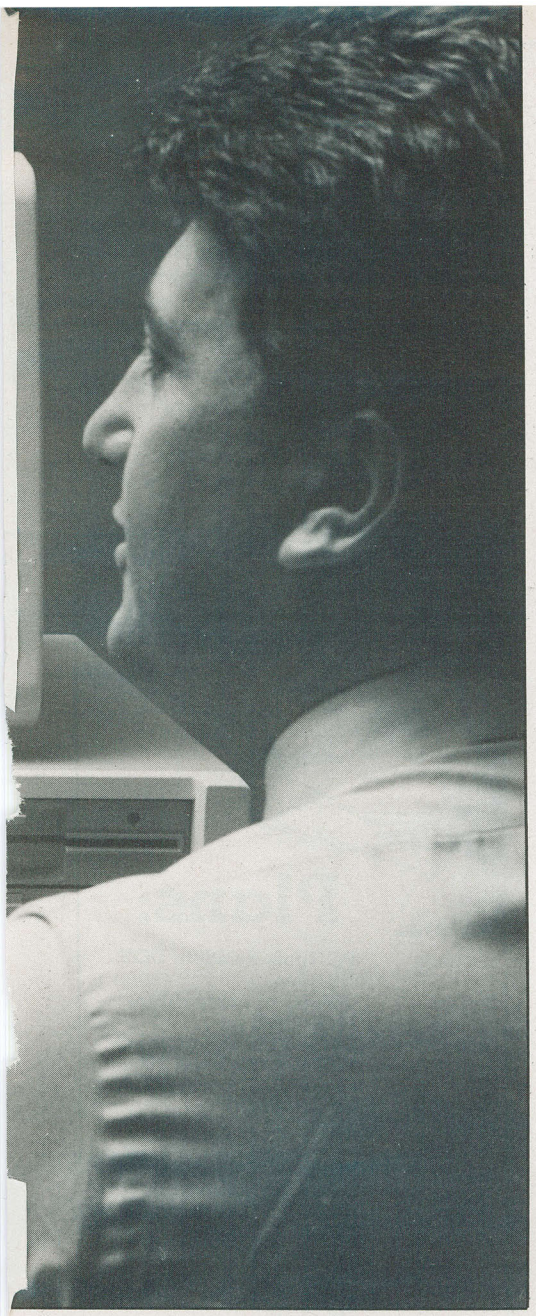
In the opposite corner, WindowDOS, the work of WindowDOS Associates, provides a purge function to erase any number of marked files in one operation, a method of password locking your computer until you return from the coffee machine, file sorting the directory display by selected parameters and the whole gamut of expected DOS file operations.

Both packages can be used in either stand alone or resident operating modes. WindowDOS is quite compact, amounting to just forty kilobytes of memory consumption when it's loaded. This would make it quite suitable for use in small memory machines, entailing little sacrifice even for spreadsheet users. While allowing a greater range of functions, PC Tools does require just under two hundred kilobytes to get out of the starting blocks... and a quarter megabyte is recommended for its resident operation. If you happen to be running a large memory machine, the amount of RAM allocated to resident use can be adjusted upward to act as an information buffer during file operations.

Both programs are intended to be run on IBM PC and compatible hardware, in conjunction with DOS 2.0 or higher. A read me file on the WindowDOS distribution disk provides hints for operating the program with MS-DOS and on the Tandy 1000 computer. As is the case with memory resident programs, certain protocols need to be observed, or experimented with, if they are to avoid collisions with other applications. PC Tools claims to be well behaved in this respect... testing it with several other resident programs confirmed this. Little guidance is given by WindowDOS Associates about its potential compatibility problems beyond changing the order in which programs are loaded if things should lock up.

Working Bits

Bringing PC Tools to life results in the display of the foreground application disappearing, replaced by the full screen menu of functions. It is a full list indeed. Functions are selected by moving a highlighted box and pressing the enter key. Each move presents a more detailed explanation of the actions available from that selection. For example, the directory choice allows one to display and print the list of files on a selected disk, as well as sorting entries and optionally performing surgery on sub-directories.



The copy selection provides that a single file, a group of them, or an entire disk can be specified for cloning. The undelete choice offers the potential of recovering erased files and sub-directories, in much the same manner as Peter Norton's utilities do as a foreground program.

Many of the operations available can be instructed to perform their chores on a group of files that have been marked. This includes copy, delete, verify... which checks that the associated sectors are readable... print and search, which looks for a specified string in the target files.

A single file at a time may be subjected to the handling of programs for mapping, which displays how the disk sectors have been allocated by DOS and a "view edit" provision that will display the contents of a file, in both hexadecimal and ASCII format, and allow the file's contents to be edited directly. File attributes may be changed

directly, including the file status... hidden, system, read-only and archive... and the date and time of creation information.

Diskettes can be formatted under the control of PC Tools, while another routine can be found to go peeking around in the low order bytes to provide information about your hardware and current DOS configuration.

In several weeks of sporadic use, the program performed flawlessly and represents a useful utility with its asking price of forty dollars.

Windows

Despite the name, WindowDOS does not use windowing as a primary display method. As does PC Tools, when called to front and centre, this package completely removes the current screen contents in favour of its own. The opening display is a directory of the files on the current drive. From this point, use of several letter keys and all function keys may be made to invoke different tasks. Pressing F10 will flash up a box, containing a reminder of what the function keys do.

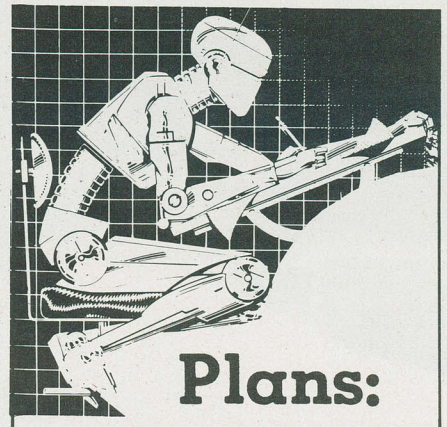
Along the bottom of the main display resides a list of other tasks that may be invoked in routine use. These include copy, directory, erase, find, list, make a directory, purge, rename, sort, tree and view. File operations, such as erase and copy, can be instructed to operate on groups of selected targets by moving the cursor to each file in the displayed directory and pressing the plus key. Deselection is accomplished in the same manner, but using the minus key. Filenames may also be specified for individual hits and DOS wildcard characters can be used.

Function keys allow access to features such as rereading the directory, free disk space, system path names, changing the file attributes, the password locking mechanism I mentioned before, changing the printer ports and control codes and access to the time and date settings. The general operation of the functions is quite quick and no draw backs are to be found in the user interface... the layout is consistent and predictable.

When first loading the program, several command line switches can be used to tailor the running characteristics to your liking. Several involve the protocol to be used when sorting directory entries for display. Others are used for display hardware configuration, a screen blanking routine and the selection of resident or foreground operation. Any number of these can be combined on the command line at start up.

The documentation that accompanies the package is slim, but entirely adequate. The presentation is very task oriented and wastes little time discussing the intricacies of DOS itself. Again, through several weeks of use, WindowDOS performed flawlessly. In spite of the lack of specific guidance in working with other resident programs, it got along perfectly with several others, including SideKick, which didn't care whether it was loaded before or after WindowDOS.

With an asking price of fifty dollars American, the program's main strength is the minimal territory it occupies in memory.



Plans:

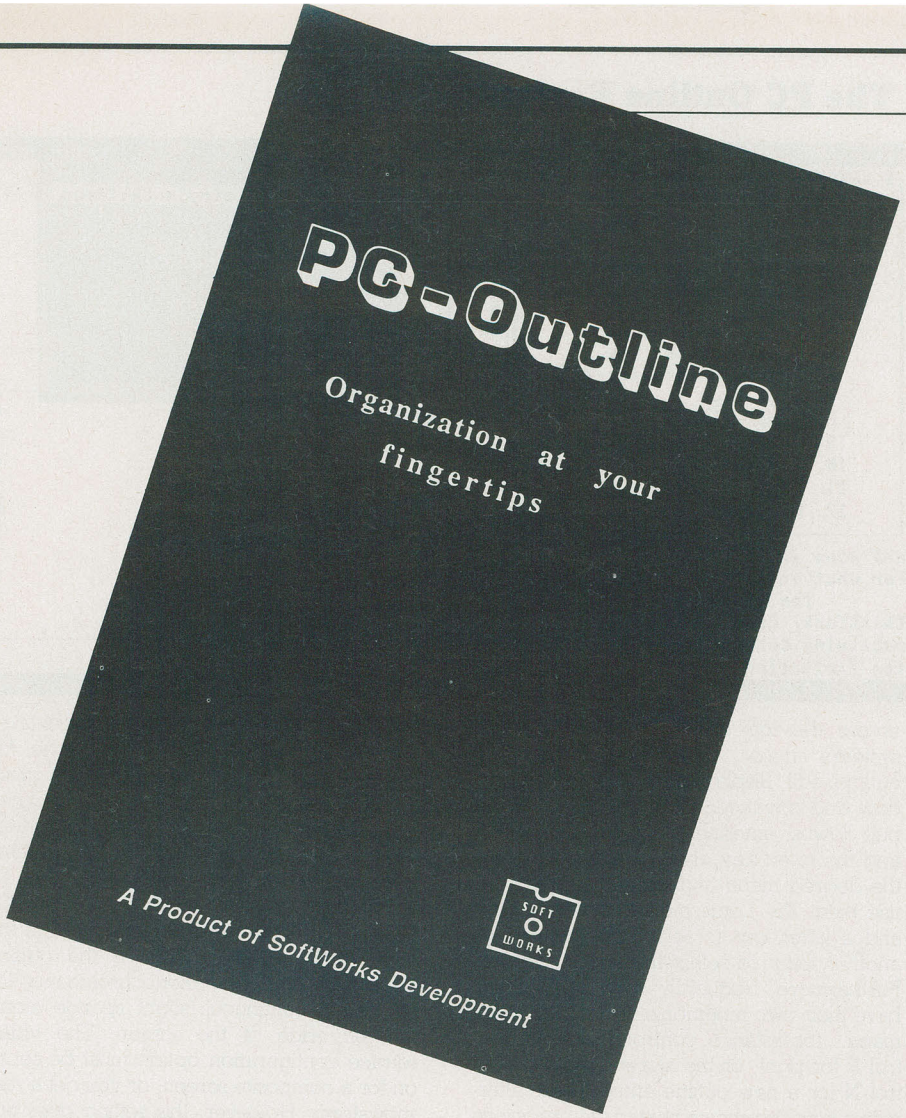
Software:	**PC Tools Resident DOS Utilities**
System:	**IBM PC or compatible, 128K, DOS 2**
Manufacturer:	**Central Point Software, 9700 Capitol Hwy. 100, Portland, Oregon 97219, (503) 244-5782**
Price:	**$39.95 US**
Software:	**WindowDOS Interactive DOS Utility Program**
System:	**IBM PC or Compatible, DOS 2**
Manufacturer:	**WindowDOS Associates, Box 300488, Arlington, Texas 76010, (817) 467-4103**
Price:	**$49.95 US**

Lacking some of the additional features to be found in PC Tools, this program falls a bit short in a head to head comparison.

Loaded

Adding DOS services to application programs results in a more flexible package. Since neither of the packages is copy protected, they may be transferred onto other diskettes and their loading included in an AUTOEXEC.BAT file. According to how your foreground program handles things like the dreaded disk full error, they just could save a barrel of retyping by allowing old files to be deleted and saves attempted again.

CN!



The PC-Outline Review

If your ideas are scattered about the cosmos doing nothing, they probably want processing. Here's a look at a software Quisinart.

by Frank Lenk

Outline processors are sort of the black sheep of the software family. They defy traditional categories, crossing the boundary between databases and word processors. Not everyone sees the need for this particular kind of hybrid.

It is odd, therefore, to bump into a package that supersedes the established competition in this nebulous field... and does it so successfully as to establish a new reference point for what an outline processor should be.

The whole field of outline processing was opened up by ThinkTank, from Living Videotext. ThinkTank introduced the outlining concept and offered limited text editing, but it had the limitation of never being around when you most needed it, that is, while you were word processing. To remedy this, Living Videotext introduced Ready!, a co-resident program using the same basic ThinkTank structure. Unfortunately, Ready! sacrificed all semblance of text editing, leaving users on the horns of a dilemma. Either you were outlining or you were writing. This tended to preclude the sort of free form brainstorming that outline processing was all about in the first place.

PC-Outline was written last year by John Friend, a California software consultant. A "big believer in the hierarchical way of working", Friend had looked at the existing outline processors but was not satisfied with any of them. He found ThinkTank, for example, too limited in its editing capabilities, and too "mode oriented". Friend proceeded to design a system of his own, embodying all the improvements he felt essential. The program was written entirely in assembler, and was released in January of this year as shareware under the aegis of his company, SoftWorks Development.

Out Of The Blue

In contrast to previous systems, PC-Outline has no modes. There is little distinction between outlines and just plain text. You can position the cursor wherever you like and start typing away. Furthermore, PC-Outline detours the ThinkTank versus Ready! problem by offering both command line and co-resident operation in the same program.

PC-Outline consists of PCO.EXE... the program itself... and two configuration files... one for the program setup and another for printer codes. PCO.EXE is only about seventy kilobytes in size, making it handy for floppy users.

When running PCO initially from the command line, you may append a number of optional parameters. Adding /b forces the program into monochrome operation... something you can make more permanent from the configuration menu. The /l option specifies a subdirectory to search for the configuration files. Adding /m= and some number will tell PC-Outline how many kilobytes of RAM to set aside for your outlines. According to the manual, the program itself takes up about sixty kilobytes and the workspace defaults to another sixty-four. The default provides lots of elbow room, but you might want to decrease it in order to save RAM.

Appending the parameter /r will make PCO load as a resident program. Thereafter you can call it up by hitting control backslash, although this invoke keycode may be reset using the KEYSET utility provided.

Outlining in PC-Outline is standard. You start on the first point and type a heading. You can keep right on typing, inserting carriage returns, tabs and even printer codes as you go. Its word processing functions are quite complete, and easy to learn. For instance, cursor moves are assigned to the arrow keys. Shifting an arrow elevates the movement to a word at a

time. Using control with an arrow makes it delete a word at a time, either forward or backward.

When you're ready to start a new point in the outline, hit either control return or control N. The cursor will drop down and a new point... for instance number two... will display in reverse video. While it's highlighted you can use the arrow keys to move the new point to any position on the outline... above the previous entries or to the right to become a sub-entry of the previous one. As you move the point around the screen its numbering automatically changes to reflect its position. As soon as you start typing in some text, the highlighting vanishes and your point is fixed in place.

The real power of the outlining method becomes apparent once your text starts to grow beyond the confines of a single screen. The large plus key at the right of the keyboard acts as a toggle, hiding or revealing all the sub-points of the current one. Control page down can be used similarly to hide or reveal any text attached to a point. These controls allow you to take a bird's eye view of your outline, making it easy to restructure your work as you go along. Then you can pop open any of the subsections and go on with detailed entry. Menu commands let you hide or show all your points at one time.

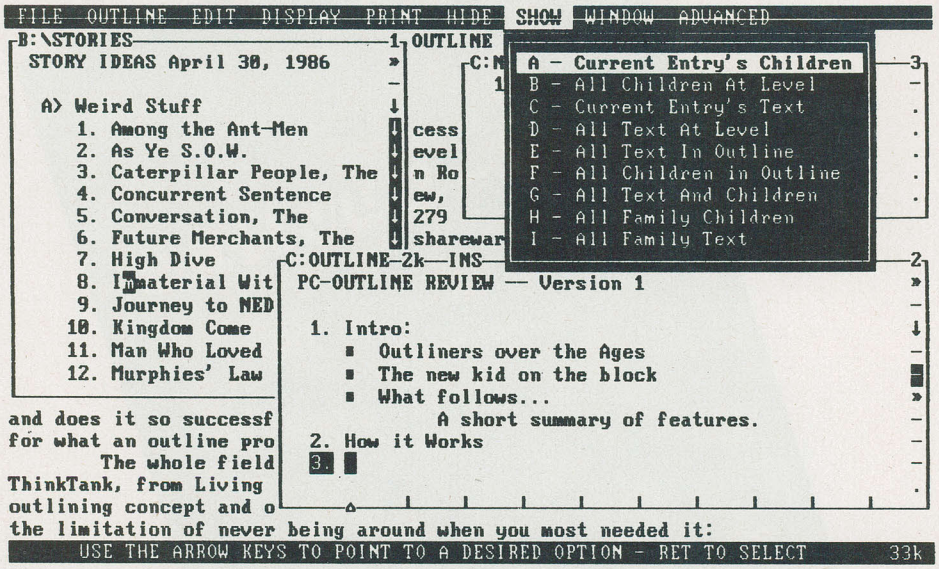
PC-Outline offers all sorts of editing controls. You can highlight a point by hitting F2, then use F5 and F6 to "promote" or indent it, changing its ranking in the outline. You can also do block moves and copies of either points or any text attached to them.

The windowing functions in PC-Outline are impressive. You can open up to nine separate outline windows at one time, each of them showing a different outline file. You can resize and move each window to suit yourself. To select the active window simply hit the alternate key and the appropriate number key at the top of the keyboard.

Formatting under PC-Outline is highly flexible. You can have decimal numbering... as in "1.1" then "1.1.1" and so on. Alternately, you can have capital letters, lowercase letters, roman numerals or just bullets. You can have your text centered, ragged right or right justified. In fact, the justification feature is frighteningly fast. If you make changes in the middle of a long paragraph the remainder of the text shifts over so quickly that you'll wonder at first just what's going on.

Furthermore, PC-Outline lets you import from or export to virtually any other environment. For instance, the export operation lets you prefix all lines with quote marks, or terminate them with down arrows rather than carriage return... perfect for moving information into a spreadsheet.

Commands in PC-Outline are easy to learn, mainly because they can be accessed in so many different ways. A menu bar



across the top of the screen shows the system's major options, including file, outline, edit, display, print, hide, show, window and advanced. You can use these as pull downs, entering the menu bar by hitting the insert key, then cursoring to select the desired menu and option. Or you can use them like Lotus menus, hitting a slash and a letter key to select the menu, then another letter to select the specific option. Furthermore, frequently used options will have their own mnemonic control key command... for instance, control S for save, control P for print, or the aforementioned control N for a new outline entry. These alternative keys are shown next to the options on their pull down menu, giving you a chance to learn as you go.

Finally, if all else fails you can hit F1 and view a full screen of keyboard help. This tells you about movement, deletion, and other function keys. If you're still not happy, PC-Outline includes its own keyboard macro function that lets you redefine things to suit your own taste.

The documentation for PC-Outline is simple and to the point. A fifty page booklet covers all the major menu and keyboard options, one by one. Several pages at the start describe configuration and provide a brief tutorial on creating your first outline. The introductory material is reproduced as a text file on the distribution disk. To get the printed manual you'll have to register a copy of the software with SoftWorks.

Complaints

As I've mentioned, a block of text can be hidden by means of the control page down keys, leaving only the top line visible. Any modification of this visible line... or even a press of the right arrow key... will automatically reveal the hidden block. However, using the shift arrow word right function while in the visible top line of a hidden block inevitably crashed my system. John Friend was unaware of this bug until he tried the suspect operation himself while I was explaining it to him on the phone. He seemed certain that eliminating the glitch would be a matter of only a few minutes' programming, so I think we can safely assume that future purchasers of PC-Outline need feel no concern.

A truly trivial problem I had with PC-Outline 1.04 has already been fixed in the new version 1.06. While in the outline display my composite monochrome monitor showed a continuous slight sparkle along the left edge of the screen. The video retrace configuration option must be set to on for a composite screen, or you get a real snowstorm. However, this setting does not eliminate the slight residual sparkle, which is caused by updating of the onscreen time display shown at the top of your active outline window. The new version of PC-Outline allows updating to be reset so that it occurs only when a key is pressed, rather than continuously.

Pulling up the PC-Outline display from the DOS prompt has one small quirk to it. Occasionally you will have to hit return after hitting your selected PC-Outline activation key. This will occur only if you've already entered any other character on the command line... even if you've immediately backspaced it out of existence. This trick is not really a problem once you realize what's happening. In fact, it actually has beneficial side effects. By using very legal polling of the command line, PC-Outline ensures maximum compatibility with other co-resident software... especially keyboard enhancers such as ProKey and SuperKey.

The copy of PC-Outline I received for review was version 1.04. When I spoke to SoftWorks a few days after receiving the program, I discovered that it had already evolved up to version 1.06. The latest release adds several small enhancements.

In PC-Outline, control D is a command to delete the outline under the cursor. Considering how much stuff you can nest into a

single outline entry, this single keystroke carries somewhat frightening power. Fortunately it won't work on the top line of your entry. In the new version there's a further safety feature... hitting control D now gives a warning prompt. This can be disabled, if you prefer to sacrifice safety for speed.

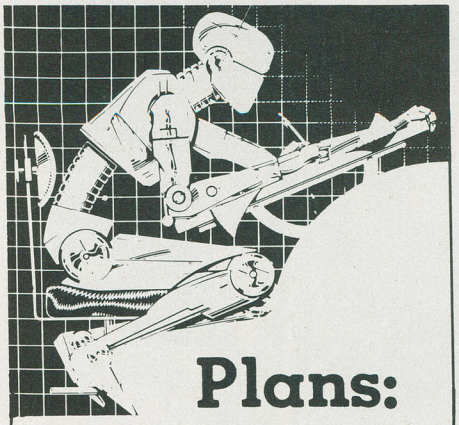
Another small improvement in version 1.06 is the use of the invoke key to both enter and exit outline mode. On my copy you could escape to the original application only by hitting escape.

Users of true TTL monochrome monitors will appreciate the addition of low intensity display support in the new version.

An invisible benefit claimed for the newest rendition of PC-Outline is improved compatibility with all the other co-resident software. I'm not sure what packages the improvement actually affected. My version ran fine with Bellsoft PopUps, ProKey from RoseSoft and Lettrix from Hammerlab. Co-resident buffs need not worry about conflicts.

Future versions of PC-Outline will probably incorporate some manner of mouse support. The mouse is a natural for use with the program's drop down menu display. It should also make it easier to shuffle outline elements around your screen.

Other major enhancements will be waiting on finalization of the proposed new co-residency standards, now being thrashed out among the various major developers



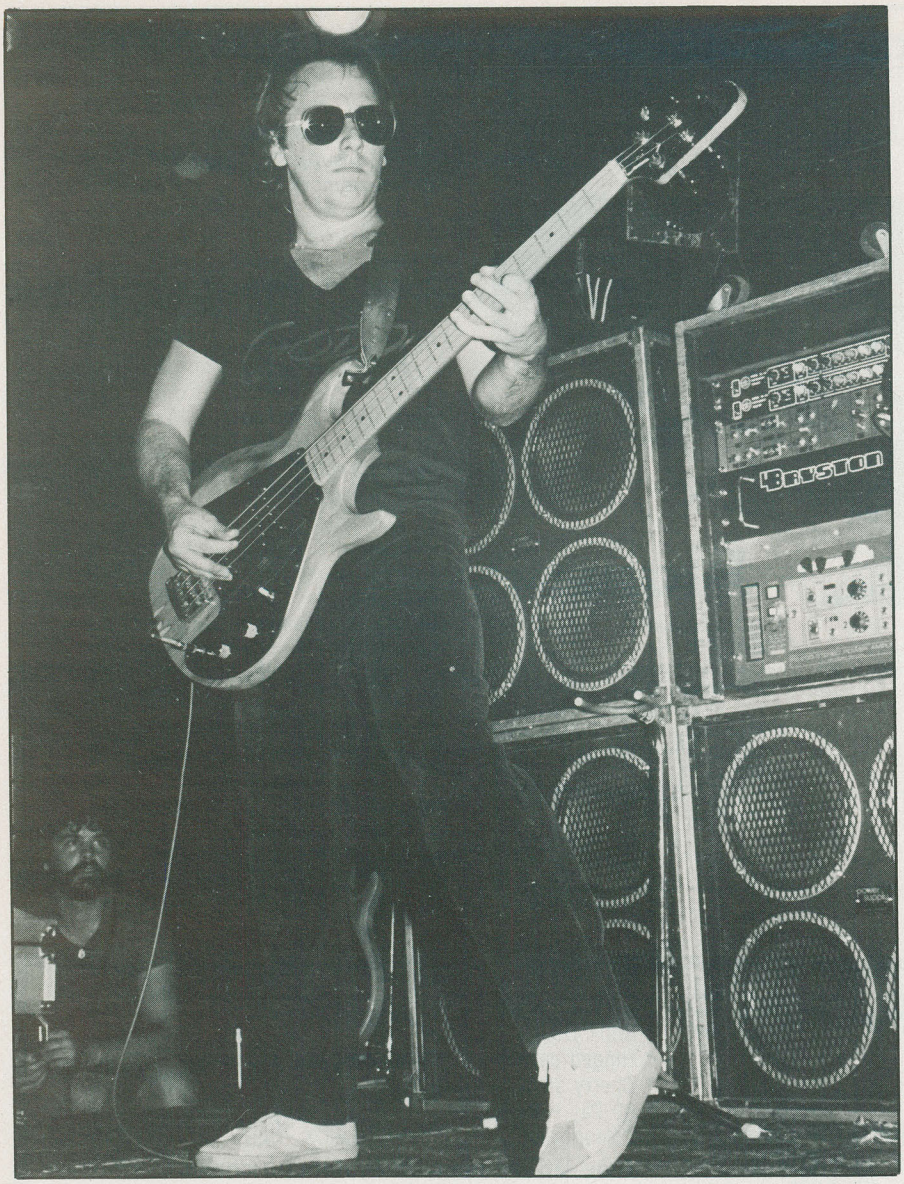
Plans:

Software:	**PC-Outline**
System:	**IBM PC**
Application:	**Outline processor**
Manufacturer:	**Softworks Development, 750 Stierlin Road, 142, Mountain View, California 94043, telephone (415) 962-1279**
Price:	**$49.95 US (shareware registration)**

of pop up utilities. One possible PC-Outline upgrade that will definitely be on the back burner is support for Lotus Intel type extended memory boards. If the new software standard is completed as expected... sometime later this year... it should clear the way for all sorts of new development.

As I noted before, PC-Outline is being distributed as shareware. You can freely copy the distribution disk, and you are free to obtain PC-Outline from friends, bulletin boards or wherever you can. Registration costs about fifty dollars American. Softworks Development will supply registered copies directly, at a cost of $54.95... including shipping.

Further improving the value of PC-Outline is an excellent set of little utility programs that are thrown in to the package. These include MEM, which gives you a reading of available RAM without forcing you to do a much slower CHKDSK. GLOBAL is a program that, when prefixed to any valid DOS command will cause it to act across all directory boundaries. PUSHDIR and POPDIR, when included in an appropriate batch file will allow you to run a program in another directory then return to your original directory after you quit. MOVE is a decent delete after copy file mover. There are several more. **CN!**



Apple Guitar Tuner

Perhaps the most expensive and complex frequency standard on the planet at the moment with the possible exception of a few atomic clocks, an Apple can emit just the right tones to tune a guitar by.

by Jim Dawson

Rub an Apple the right way and it will make some fairly decent noises. Polish it and you will end up with a pretty fair musical standard. The program in this feature won't make the cats that hang out in your yard sing any better than usual, but it will bring your guitar up to perfect pitch.

Few things in life sound much worse than an out of tune musical instrument. An out of tune guitar can make an alley full of cats swearing their undying love to each other sound downright pleasant in comparison. Even relative tuning has its weaknesses. Unless the person setting the standard for his instrument or for the group has perfect pitch, the standard is valid only for the particular instrument or group for a specific time.

The solution to all this is a tuning standard, one which is right all the time and about which there is no debate. This little program uses the sound generating capabilities of the Apple to provide an easily used tuning standard. A short assembler language routine is POKEd into memory by the BASIC calling program and provides open string notes for tuning six and twelve string guitars.

Strings

If you have only a six string guitar, the program can be readily cut in half by removing the menu and all reference to twelve stringed instruments. Delete line 230 for starters and delete... or don't bother typing... lines 430 to 690. Lines 820 to 880 are not required for six string guitars and the lines referring to

```
IF FLAG = 1
```

such as line 700, can be replaced by a PRINT statement if you wish.

The timing loops involved in this tuning standard depend for their own accuracy on the degree of precision used in Cupertino... or Taiwan... when the Apple you're using was assembled and tested. It is unlikely, however, that the crystal oscillator frequencies in different Apples will vary more than a few hertz one from the other. A single machine language clock cycle in the Apple is, all being well, $0.97779 * 10^{-6}$ seconds in duration. It would take a rather extravagant departure from this value to make any perceptible difference in the actual tones produced. If you find any adjustment is necessary in running this program... my own version was checked against a Korg tuning standard... the values for P can be modified slightly. A larger value for P will sharpen a note and a lower version will flatten it.

If you are sufficiently interested to have read to this point, I am going to assume you know how to tune your guitar, listen for a beat note and so on. Using this program, though, you tune all the strings open. No fretting is needed.

One particular problem came up in writing the program. While a perfectly valid low E is generated by the assembler language routine, the next open string note, a low A, produced a sound which sounded to my ears, at least, more like a slightly sharp F than an A. The Korg standard, however, showed a perfect A. True, one could sing it or tune a string to it if one were to start with the sound produced by the Korg. For that matter, if both the Korg and the Apple were producing the A simultaneously, the Apple A was perfectly acceptable. Used independently, though, it sounded like a sharpened F.

The mystery remains to be explained. Perhaps it is an internal resonance in the case, a harmonic produced by the speaker itself, or a phenomenon of aural perception of a series of square waves with extremely rapid rise and fall times and relatively wide spacing between successive waves. Whatever the case, tune your low A string one octave down from the middle A produced by the Apple. It is worth noting, as an aside, that many musicians prefer to tune instruments such as the bass guitar from a standard one or even two octaves higher than the actual value of the note required. It is vastly harder to hear subtle changes in value of low tones as a string is tightened or loosened slightly.

The Program

Except for the assembler language sound generating routine, something you needn't worry about directly, since it is POKEd into memory by BASIC, the program is so simple as to need no comment. In fact, if you are not into 6502 assembler language, you can skip this part altogether and get on with typing the program and making music.

The disassembled listing below that the machine language portion of the program really starts at location $0302, decimal 770. The lengths of notes are POKEd into $0300 and the pitch into location $0301, decimal locations 768 and 769 respectively, by the BASIC program.

A series of nested loops ensure that each note is played at the correct pitch and held for a reasonably long period of time, about ten seconds, so that the musician using the tuner has a fairly good chance of tuning a given string at the first attempt. Any open string guitar note may be played at will, however, and may of course be repeated as often as necessary. If you find the notes played are too long or too short, you might want to adjust L in the Applesoft program to suit your needs. Note, however, that neither L nor P may exceed two hundred and fifty-five.

There is, in the Apple an unfortunate correlation between the pitch of a note and the length of time it will sound for. Some compensation is introduced in the algorithm by including the value for pitch in the actual running of the program as a factor in modifying the time for which a note will sound. Further adjustment can be made by playing with L. In the case of the G, the maximum possible value for L of 255 would produce a tone for some five seconds only, shorter in any case than the other notes. A compromise is made in this case. L is made slightly shorter and in line 770, GOSUB 790 is invoked twice.

The ideal tuning standard would produce a sine wave free of harmonic content altogether. Apples do not send sine waves to their speakers, alas. The best they can manage is a series of square waves of ex-

Program one, the Applesoft guitar turner

```
100  HOME : VTAB 7: HTAB 14: PRINT "==========": PRINT : PRINT : PRINT : HTAB 14: PRINT
"=========="
110  VTAB 9: HTAB 15: PRINT "GUITAR TUNER"
120  VTAB 14: HTAB 6: PRINT "(C) 1985 - ORMSTOWN, QUEBEC": PRINT
130  HTAB 19: PRINT "BY": PRINT
140  HTAB 15: PRINT "JIM DAWSON"
150  VTAB 23: PRINT "      PRESS ANY KEY TO GO ON...";: GET A$
160  FOR M = 770 TO 795
170  READ C
180  POKE M,C
190  NEXT
200  DATA  172,01,03,174,01,03,232,208,253
210  DATA  169,04,32,168,252,173,48,192,136
220  DATA  208,239,206,00,03,208,231,96
230  GOTO 920
240  HOME : VTAB 22: PRINT "((STRINGS NUMBERED LOWEST TO HIGHEST))"
250  POKE 32,6: PRINT
260  VTAB 4: PRINT "STRING  NOTE    PRESS..."
270  PRINT "=========================": PRINT
280  PRINT "1ST.    LOW E   [CTRL] E"
290  PRINT "2ND.      A     [CTRL] A"
300  PRINT "3RD.      D     [CTRL] D"
310  PRINT "4TH.      G     [CTRL] G"
320  PRINT "5TH.      B     [CTRL] B"
330  PRINT "6TH.   HIGH E       E"
340  VTAB 23: PRINT "((PRESS 'ESC' TO QUIT))"
350  VTAB 18: PRINT "WHICH NOTE, PLEASE? ";: GET A$
360  IF A$ =  CHR$ (27) THEN  TEXT : HOME : END
370  TEXT : HOME
380 P =  ASC (A$)
390  IF P = 3 OR P = 6 THEN 250
400  IF P ) 7 AND P ( 69 THEN 250
410  IF P ) 69 THEN 250
420  GOTO 720
430  HOME : VTAB 22: PRINT "((STRINGS NUMBERED LOWEST TO HIGHEST))"
440 FLAG = 1
450  POKE 32,6: PRINT
460  VTAB 1: PRINT "STRING   NOTE     PRESS..."
470  PRINT "==========================": PRINT
480  PRINT "1ST.   LOW E      [CTRL] E
490  PRINT "2ND.   MID E         ME "
500  PRINT "3RD.   LOW A      [CTRL] A"
510  PRINT "4TH.   MID A         MA "
520  PRINT "5TH.   LOW D      [CTRL] D"
530  PRINT "6TH.   MID D         MD "
540  PRINT "7TH.   LOW G      [CTRL] G"
550  PRINT "8TH.   MID G         MG "
560  PRINT "9TH.    B         [CTRL] B"
570  PRINT "10TH.   B         [CTRL] B"
580  PRINT "11TH.   E             E"
590  PRINT "12TH.   E             E"
600  TEXT : VTAB 23: PRINT "        PRESS 'Q' TO QUIT"
605 N$ = "":A$ = ""
610  HTAB 6: VTAB 18: PRINT "WHICH NOTE, PLEASE? ";A$;: IF A$ = "E" THEN 720
611  GET N$
615 P =  PEEK ( - 16384): IF P ( 8 THEN 720
620  IF N$ = "Q" THEN  HOME : END
```

tremely short duration spaced at specific intervals. The speaker is, in fact, plucked with brief pulses... if this were done once only, all you would hear would be a faint click. If, however, the clicks follow each other regularly and rapidly enough, the ear is fooled into thinking it hears a recognizable note.

The actual duration time of the pulse which clicks the speaker does not vary. What does change is the delay in the Apple WAIT subroutine at $FCA8 and the variable delay in $0308 to $0310. Both these variables affect the pitch produced, the former by introducing a relatively subtle change in pitch for each unit of increment or decrement. The actual formula is

$$T = 0.5(x + 27x + 26)$$

where the delay value, *x*, is in the accumulator. T is in microseconds.

This is the same routine that is used by the Applesoft SPEED command, by the way.

```
*302L

0302-   AC 01 03    LDY   $0301
0305-   AE 01 03    LDX   $0301
0308-   E8          INX
0309-   D0 FD       BNE   $0308
030B-   A9 04       LDA   #$04
030D-   20 A8 FC    JSR   $FCA8
0310-   AD 30 C0    LDA   $C030
0313-   88          DEY
0314-   D0 EF       BNE   $0305
0316-   CE 00 03    DEC   $0300
0319-   D0 E7       BNE   $0302
031B-   60          RTS
031C-   00          BRK
031D-   00          BRK
031E-   00          BRK
031F-   00          BRK
0320-   00          BRK
0321-   00          BRK
0322-   00          BRK
0323-   00          BRK
```

Program two. The machine code to make noises.

In any case, as long as the train of square waves is produced with the correct interval between them, the ear will hear an open string note and tuning the guitar accurately presents no problem.

If your next hootnanny is not a success, you will not be able to blame badly tuned guitars, and your local prima donna who had heretofore though herself endowed with perfect pitch may find her thinking being revised by your Apple tuning standard.

CN!

```
625 A$ = A$ + N$: IF  LEN (A$) < 2 THEN  VTAB 18: HTAB 25: PRINT A$: GOTO 610
630  IF  LEN (A$) > 2 THEN 430
640  IF  LEN (A$) = 1 THEN P =  ASC (A$): GOTO 720
650  IF A$ = "NA" THEN P = 47:L = 160: POKE 780,04:K$(1) = "MID A":J$(1) = "4TH.": GOSUB 8
00: GOSUB 790: GOTO 700
660  IF A$ = "ND" THEN P = 106:L = 125: POKE 780,04:K$(1) = "MID D":J$(1) = "6TH.": GOSUB
800: GOSUB 790: GOTO 700
670  IF A$ = "NE" THEN P = 170:L = 10: POKE 780,30:K$(1) = "MID E":J$(1) = "2ND.": GOSUB 8
00: GOSUB 790: GOTO 700
680  IF A$ = "NG" THEN P = 149:L = 75: POKE 780,04:K$(1) = "MID G":J$(1) = "8TH.": GOSUB 8
00: GOSUB 790: GOTO 700
690  GOTO 700
700  IF FLAG = 1 THEN 430
710  GOTO 240
720  GOSUB 800
730  IF P = 1 THEN P = 47:L = 160: POKE 780,04:K$(1) = "A":J$(1) = "2ND.": GOSUB 800: GOSUB
790: GOTO 700
740  IF P = 2 THEN P = 72:L = 135: POKE 780,04:K$(1) = "B":J$(1) = "5TH.": GOSUB 800: GOSUB
790: GOTO 700
750  IF P = 4 THEN P = 94:L = 27: POKE 780,30:K$(1) = "D":J$(1) = "3RD": GOSUB 800: GOSUB
790: GOTO 700
760  IF P = 5 THEN P = 152:L = 10: POKE 780,45:K$(1) = "LOW E":J$(1) = "1ST.": GOSUB 800: GOSUB
790: GOTO 700
770  IF P = 7 THEN P = 19: POKE 780,04:K$(1) = "G":J$(1) = "4TH.": GOSUB 800:L = 200: GOSUB
790: GOSUB 790: GOTO 700
780  IF P = 69 THEN P = 125: POKE 780,04:L = 110:K$(1) = "E":J$(1) = "6TH": GOSUB 800: GOSUB
790: GOTO 700
790  POKE 768,L: POKE 769,P: CALL 770: RETURN
800  HOME :K$ = "THE NOTE BEING PLAYED IS ":I$ = " STRING"
810  IF FLAG = 0 THEN 890
820  IF P = 47 THEN J$(1) = "STRINGS #3 & #4":I$ = "": GOTO 890
830  IF P = 106 THEN J$(1) = "6TH.": GOTO 890
840  IF P = 94 THEN J$(1) = "5TH.": GOTO 890
850  IF P = 170 THEN J$(1) = "2ND.": GOTO 890
860  IF P = 149 THEN J$(1) = "8TH.": GOTO 890
870  IF P = 72 THEN J$(1) = "STRINGS 9 $ 10":I$ = "": GOTO 890
880  IF P = 125 THEN J$(1) = "STRINGS 11 & 12":I$ = "": GOTO 890
890  VTAB 8: HTAB 8: PRINT K$;K$(1): PRINT : PRINT : HTAB 16: PRINT J$(1);I$
900  IF P = 47 THEN  VTAB 14: HTAB 5: PRINT "(<TUNE LOW 'A' ONE OCTAVE DOWN>)"
910  RETURN
920  HOME : VTAB 6: HTAB 16: PRINT "=========": VTAB 10: HTAB 16: PRINT "=========": VTAB
8: HTAB 17: PRINT "OPTIONS"
930  VTAB 13
940  HTAB 10: PRINT "A]   6 STRING GUITAR": PRINT
950  HTAB 10: PRINT "B]  12 STRING GUITAR": PRINT : PRINT
960  PRINT "  TYPE ";: INVERSE : PRINT "LETTER";: NORMAL : PRINT " TO SELECT CHOICE --> ";
: GET A$
970  IF A$ > "B" OR A$ < "A" THEN 920
980 A =  ASC (A$) - 64: ON A GOTO 240,430
1000 P =  ASC (A$): ON A GOTO 1010,1020,1030,1040,1050,1060,1070
1010  PRINT "A": RETURN
1020  PRINT "B": RETURN
1030  PRINT "INVALID ENTRY": POP : GOTO 700
1040  PRINT "D": RETURN
1050  PRINT "E": RETURN
1060  PRINT "INVALID ENTRY": POP : GOTO 700
1070  PRINT "G": RETURN
```

PC Tube Bender

We've all encountered software written by programmers with a burning desire to use every colour the PC offers. This is a drag with a colour tube, but it can be fatal with a monochrome one, as half the colour combinations available on a PC are unreadable in black and green. This little program undoes the attributes of offensively colourful software.

by Steve Rimmer

Being able to print text in colour on the screen of a PC is an arguably useful facility. I think, however, that civilization might have been happier on the whole without it. There are a lot of souls who insist on writing programs that use some really ghastly colour combinations. They'll fry your eyes on an RGB monitor... and they'll very often look like a cubist abstract on a monochrome one.

Unfortunately, proud of their efforts, the people who write this sort of code rarely consider making the colours configurable. As such, one is very often faced with the unfortunate reality of having to squint into a gaudy looking screen for hours on end, looking for meaning in all the dots and trying to convince one's eyes that the whole effort isn't something to abandon ship over.

The program in this article is very small, but it worms its way into DOS and undoes the work of attribute freaks the world over. You can use it to take the most revolting screens in creation and render them readable. It also speeds up one's PC just a bit.

More Interrupts

Virtually all the tricky little programs one finds to do things like this take the form of resident interrupt handlers... and this one is no exception. The interrupt which ultimately gets characters to the PC's screen is the 10H'th interrupt, perhaps the most involved call in the PC's BIOS. Unlike the simple interrupts that one normally traps, the clock tick, for example, this one has a plethora of sub-modes. Unless one fancies writing a whole new BIOS... probably not a reasonable undertaking, all things being considered... programs which meddle with this thing have to be a bit discerning and selectively fiddle with the call's subfunctions.

To clearly define the problem that this patch is intended to solve, characters are printed to the screen with the 10H'th interrupt's character handling subfunctions, these being nine and ten. It's actually function ten that adds the attribute... function nine just prints bytes. However, it's worth while trapping them both for this application. What we really want to do is to kill all the attributes, replacing them with one that isn't nasty to look at.

The attribute arrangement of the PC may take a bit of explaining. In most cases one can just load up the appropriate registers, but in dealing with this program it's essential that one actually see what these nasty little bytes are up to.

The screen of the PC... assuming that it's in its regular eighty column text mode... is a buffer of four thousand bytes of memory. In the case of the colour card... which is what this program is written for... this starts at segment 0B800H. Every odd numbered byte is a character, that is, loading values into these bytes will cause

characters to appear on the screen. Every next higher even numbered byte is the attribute for its corresponding character. This determines the colour of the byte in question.

Given the co-ordinates of a character on the screen, we can determine the offset of the two bytes that make it show up with the formula

(160 * y) + (x * 2)

The one hundred and sixty is the screen width times two, as there are two bytes per character. You can see a machine language implementation of this formula in the LOCATE subroutine in the program.

The attribute bytes themselves follow a fairly simple pattern... and are, for the most part, a drag to try to calculate. The eight bits of the byte are broken up such that the first three determine the colour of the foreground. If all three are zeros the foreground is black. If all three are ones the foreground is white, with the traditional colours in between. The fourth bit determines whether the colour will be normal brightness or high intensity... rendering an additional eight colours, for a total of sixteen.

The fifth, sixth and seventh bits of the attribute set the colour for the background. Under normal circumstances you only get eight colours for the background. The highest bit determines whether the character is blinking or not.

In this program we want to control the attribute bytes, that is, set all the attributes to something reasonable before they hit the screen. We can do this either by trapping all the calls to the BIOS and just changing the attributes or by trapping the calls and doing the actual writing to the screen ourselves. There is some advantage in doing it with the latter approach... it speeds up the writing process a bit... generating a bit of screen snow as a side effect... and it allows us to trap calls to the BIOS which don't contain attribute functions.

The mechanism for setting up a resident interrupt handler should be fairly common by now. If you aren't tight with it you might want to check out the past few editions of Computing Now!, in which we looked at the procedure in a bit more detail. Suffice it to say that this program, when run, will load itself into memory, hook into the interrupt vector table in the PC's low RAM and finally protect itself from being overwritten by subsequent programs before it returns control of things to DOS. The rest of the party occurs only indirectly, as calls to the BIOS are scrutinized by the handler and trapped if they happen to contain requests to write to the screen.

Every time a program goes to write to the screen through the BIOS interrupt it will pass through the HANDLE_BYTE code. The submode number is passed in AH...

Listing one

```
                COMMENT -

        attribute trasher

        undoes the attributes generated by
        excessively colourful software on
        monochrome tubes

        do not open cover...  no user serviceable
        parts inside.

        copyright (c) 1986 steve rimmer



VERSION         EQU     1       ;VERSION NUMBER
SUBVERSION      EQU     0       ;SUBVERSION NUMBER (BLOODY SUBVERSIVES)

SCREEN_WIDE     EQU     80
SCREEN_DEEP     EQU     24

STACK_SIZE      EQU     128     ;HOW MUCH STACK OVERHEAD
TRAP_NUMBER     EQU     10H     ;INTERUPT TO TRAP (PRINTER)
TUBE_SEG        EQU     0B800H  ;SCREEN SEGMENT

ATTR            EQU     07H     ;ATTRIBUTE FOR WHITE SCREEN

                CODEX   SEGMENT
                ASSUME  CS:CODEX, DS:CODEX, ES:CODEX
MAIN            PROC    FAR
                ORG     100H

START:          JMP     INSTALL_HOOKS           ;JUMP OVER INTERRUPT HANDLERS

PAD_HANDLER:    PUSH    DS
                PUSH    AX

                MOV     AX,CS
                MOV     DS,AX                   ;SET UP LOCAL DATA SEGMENT
                MOV     AX,TUBE_SEG
                MOV     ES,AX                   ;SET UP SCREEN SEGMENT

                POP     AX
                MOV     [THIS_BYTE],AX
                MOV     [STACK_POINTER],SP
                MOV     [STACK_SEGMENT],SS      ;SAVE OLD STACK

                CLI
                MOV     AX,CS
                MOV     SP,OFFSET STACK
                MOV     SS,AX                   ;CREATE NEW STACK
                STI

                PUSH    DS
                PUSH    ES                      ;SAVE CONTEXT
                PUSH    CX
                PUSH    BX
                PUSH    DI
                PUSH    DX

                CALL    HANDLE_BYTE             ;DEAL WITH INTERUPT REQUEST

                POP     DX
                POP     DI
                POP     BX
                POP     CX
                POP     ES
                POP     DS

                CLI
                MOV     SS,[STACK_SEGMENT]
                MOV     SP,[STACK_POINTER]      ;RESTORE OLD STACK
                STI

                JNC     TO_BIOS

                POP     DS
                IRET

TO_BIOS:        POP     DS
                DB      0EAH                    ;AND DO A LONG JMP
```

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that's why this program checks for AH being equal to nine or ten. If one of these modes turns up, the code passes along control to the WRITE routine, which pokes the byte in AL onto the screen at the appropriate location pointed to by the cursor position.

It's probably worth mentioning that the DOS 21H interrupt calls this one in turn if you ask it to do screen characters.

The aforementioned cursor position is a bit tricky, made more so by a peculiar bit of cheating on the part of DOS. If you change the cursor position the way you're supposed to, that is, through one of the other submodes of the 10H interrupt, the BIOS will update the value of the cursor position values in low memory and then send some numbers out through the ports that talk to the 6845 video controller chip on the colour card to make the actual cursor on the screen move. The cursor position is held as a sixteen bit word down at 50H bytes into segment 0040H, the BIOS's scratch pad RAM.

If you change this value without updating the 6845, or alternately, change the 6845 without adjusting the low memory cursor position counters quite a number of really weird things can happen, as the cursor on the screen won't show up where the characters appear. The MOVE_CURSOR code handles the updating of the 6845.

In talking to the various segments of memory that this program must deal with... to wit, the 0B800H video segment and the 0040H scratch pad segment... one has to keep track of all of the 8088's commonly used segment registers. In this case, we've used the extra segment register to point into the video buffer and the data segment to point at the scratch pad. I've explicitly put the data segment overrides in the code where things refer down to the scratch pad segment to make it easy to spot where this is going down, although they aren't strictly speaking necessary as moves to and from memory implicitly involve the data segment unless they're overridden.

In checking out the cursor position, it's worth noting that MS-DOS itself cheats on this rather heavily, something all the manuals say one should never do. When you type a character at the DOS prompt, the cursor position gets updated by directly poking a new value into the scratch pad memory, rather than by doing a BIOS call. As such, simply looking for 10H cursor mover calls and updating the cursor when they happen isn't cool for DOS... the cursor doesn't move... although it works for most programs, like WordStar. This is why this code goes to the trouble of using the scratch pad memory rather than some internal buffers.

As a final note, the use of the carry flag might be a bit mysterious in this thing. If the code writes directly to the screen, we don't want to thereafter trip on over to the BIOS and print the character a second time. In

```
VECTOR_OFFSET:  DW      0                       ;TO THE REAL VECTOR
VECTOR_SEGMENT: DW      0                       ;(FILLED IN BY HOOKERS)
STACK_POINTER:  DW      0
STACK_SEGMENT:  DW      0                       ;OLD STACK POINTER
THIS_BYTE:      DW      0                       ;CURRENT AX VALUE

                DB      STACK_SIZE DUP(0)       ;LOCAL STACK BUFFER
STACK:          DW      0

MAIN            ENDP

STUFF           PROC    NEAR

HANDLE_BYTE:    MOV     AX,[THIS_BYTE]          ;GET THE BYTE TO PRINT

                PUSH    AX
                MOV     AX,0040H                ;SET UP DATA SEGMENT TO 0040H
                MOV     DS,AX
                POP     AX

                MOV     DX,DS:0050H             ;GET THE CURRENT CURSOR POS

                CALL    LOCATE                  ;FIND OUT WHERE TO STUFF IT

                CMP     AH,10                   ;CHECK FOR MODE TO WRITE BYTE
                JE      WRITE                   ;WITH ATTRIBUTE
                CMP     AH,9
                JE      WRITE                   ;WITHOUT ATTRIBUTE
                CLC
                RET


;THIS ROUTINE WRITES THE BYTE AT THE CURRENT POSITION
WRITE:          MOV     AH,ATTR                 ;FORCE OUR ATTRIBUTE
                CLD
REP             STOSW                           ;WRITE THE BYTE
                CALL    MOVE_CURSOR             ;MOVE THE CURSOR
                STC                             ;SET FOR NO BIOS CALL
                RET

;THIS ROUTINE ACTUALLY MOVES THE CURSOR ON THE TUBE
MOVE_CURSOR:    MOV     AX,DS:[0050H]           ;GET THE CURSOR POSITION
                MOV     DX,DS:[0063H]           ;GET BASE PORT OF 6845
                MOV     AL,AH
                OUT     DX,AL
                MOV     AL,AH
                INC     AL
                OUT     DX,AL
                RET

;THIS ROUTINE TAKES THE VALUE OF DX AND RETURNS A POINTER TO THE BYTE IN BX
LOCATE:         PUSH    AX
                PUSH    DX

                MOV     AH,0
                MOV     AL,DH
                MOV     DH,160
                MUL     DH

                SHL     DL,1
                MOV     DH,0
                ADD     AX,DX
                MOV     DI,AX

                MOV     AX,4096
                MUL     BH
                ADD     DI,AX

                POP     DX
                POP     AX

                RET

END_HANDLERS:   DB      0

;THIS CODE HOOKS IN THE INTERUPT VECTORS
INSTALL_HOOKS:
                MOV     AX,TUBE_SEG
                MOV     ES,AX
                MOV     DI,0
                MOV     CX,SCREEN_WIDE*SCREEN_DEEP*2
                MOV     AL,0
```

this case, the write routine sets the carry flag. All the other calls to the 10H interrupt will exit the handler with the carry flag cleared. The code down at the bottom of the main part of the handler... right past all the pops... will either execute an IRET... bypassing the BIOS completely... or a long jump to the 10H handler code, depending on the status of the carry flag.

Hackers Delight

This program has a few limitations. One of the obvious ones is that it only works for programs that print characters to the screen through the PC's BIOS they way they're supposed to. Code that cheats... like this program cheats... and writes directly to the screen buffer won't be helped by this thing at all.

This program can actually be a lot of other things, limited only by your imagination and how many disks you've got to kill. There are a lot of interesting mind games you can lay on the PC's tube with one of these little traps.

```
REP             STOSB                           ;CLEAR SCREEN (CRUDE, I KNOW)

                CLI                             ;DISALLOW INTERUPTS
                PUSH    ES
                MOV     AH,35H
                MOV     AL,TRAP_NUMBER
                INT     21H                     ;GET EXISTING VECTOR
                MOV     [VECTOR_OFFSET],BX      ;SAVE VECTOR IN CODE
                MOV     [VECTOR_SEGMENT],ES
                POP     ES

                PUSH    DS
                MOV     AH,25H
                MOV     AL,TRAP_NUMBER
                PUSH    CS
                POP     DS
                MOV     DX,OFFSET PAD_HANDLER
                INT     21H                     ;INSTALL HOOK INTO
                POP     DS                      ;LOW MEMORY VECTOR TABLE
                STI

                MOV     AH,9
                MOV     DX,OFFSET MESSAGE
                INT     21H                     ;SAY "HOWZIT GOIN'"

                MOV     DX,OFFSET END_HANDLERS  ;POINT TO OUR PROTECTED CODE
                INT     27H                     ;TERMINATE BUT STAY RESIDENT

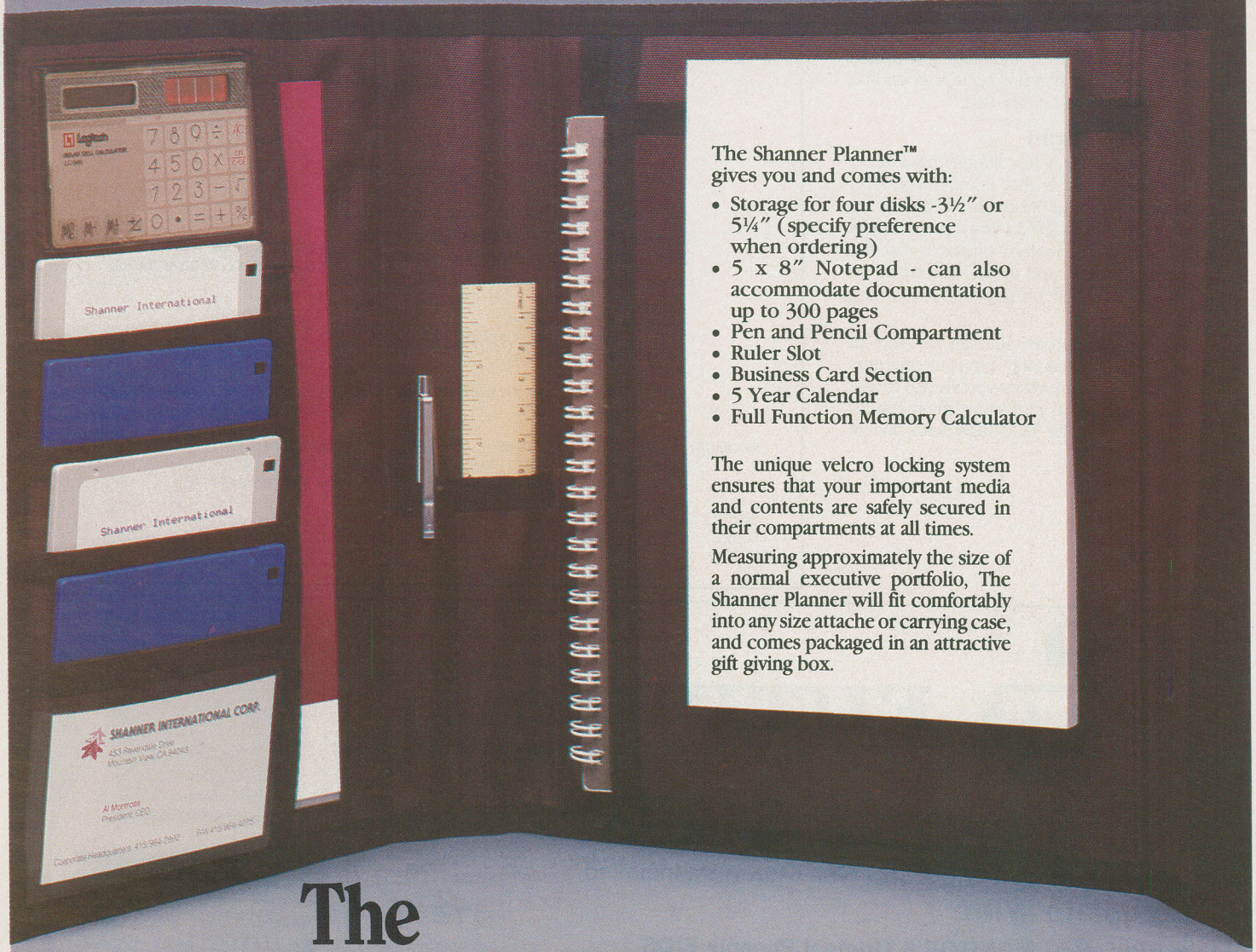
MESSAGE:        DB      'TUBE - The DOS attribute killer'
                DB      VERSION+'0','.',SUBVERSION+'0'
                DB      13,10,'Copyright (c) 1986 Steve Rimmer$'

STUFF           ENDP
CODEX           ENDS

                END     START
```

CN!

It speaks for itself.



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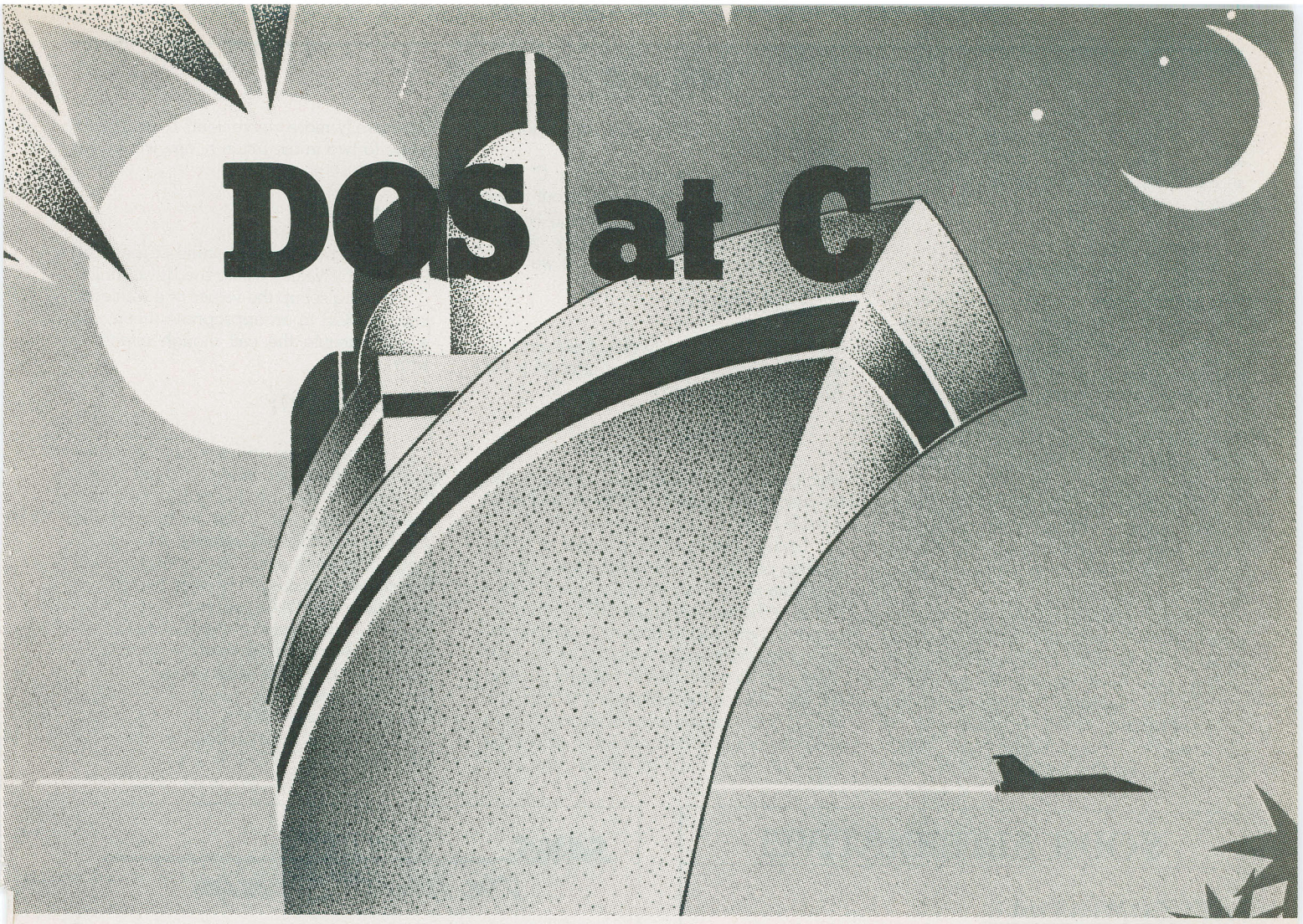


Among the powerful bits of the Lattice C for the PC is its disposition toward being on speaking terms with DOS. Here's a look at how to manage the dialogue.

by Steve Rimmer

One of the more enlightened aspects of C... at least as far as real devotees of the language are concerned... is its portability. Under ideal circumstances, this allows a program written on, say, a PC, to be ported to, say, a Macintosh and recompiled there with only superficial changes to the code.

It is a wonderful time saver when it works, of course, but there are a number of factors that conspire against it. The most obvious of these is the nature of microcomputers, to wit, all the ones which are any fun to write code for have hardware that's unique unto themselves. Thus, for example, programs which use graphics or even just operating system calls on the PC would take substantial hacking to port to a Macintosh because, while the basic functions of a program might be essentially mobile, these machine level interface things are extremely disparate.

This sort of reality greatly upsets real C idealists. Idealists are people who think that reality is a lot like real estate because they occur so close to each other in the dictionary.

Practical applications software pretty well has to interact with its environment and, as such, it's largely essential that one have access to DOS if one is writing in C on the PC. Most C compilers allow for this to some extent... Lattice's most recent C package, version three, can make DOS stand on one ear and sing the complete works of the Grateful Dead in tight harmony if you want it to. The tone, of course, is a bit loathsome through that tiny speaker...

In this article we're going to have a look at ways in which one can mutate the fine and perfect concepts of C in order to make it talk to MS-DOS programmatically. If you have an ounce of the purist in you you'll feel thoroughly reprehensible for the next few pages.

INTs and ints

The lowest level of access one has to DOS from C is usually in having C make machine language level calls to the DOS request handler. Most C compilers allow for this, usually in the form of the *intdos* function.

If we were writing in machine language, we would call DOS by stuffing a

bunch of values into the 8088's registers and throwing an INT 21H instruction. This is an example of how such a thing might be gotten together.

```
MOV     AH,3DH
MOV     AL,2
MOV     DX,OFFSET PATH
INT     21H
JNC     FILE_OPEN
```

This particular call opens a DOS two file. The setting of the AL register, two in this case, determines whether the file is opened for reading, writing or reading and writing. The label PATH should be a chunk of data representing the path name terminated by a zero byte.

Fortunately, the way that DOS likes to handle strings... bytes with nulls after them... is precisely the way that C does. As such, making this function happen under C isn't a serious effort.

The drag about getting this together under C is that you have to be tight with virtually all the machine language level information you'd have needed to have written this thing in assembler... as well as having an understanding of the peculiarities of the C interface. This involves the rather remarkable way that the authors of the compiler have seen fit to pass parameters to DOS.

One of my favourite smaller C compliers, Datalight C... as checked out in the March 1986 edition of Computing Now!... passes data to DOS in specially defined structs of the type REGS. Thus, if we

```
struct REGS r;
```

the struct *r* has four convenient elements, to wit, *r.ax* through *r.dx*. We could set up the AX register by saying

```
r.ax = 0x3d02;
```

which stuffs it with the same values as did the machine language routine we looked at a while back.

Under Lattice, this process is complicated slightly, as the things one uses to pass data to DOS are actually unions of two structs. Whereas the simple REGS struct insisted on our passing data as potentially inconvenient sixteen bit works... notice that we've had to combine the value of AL and AH into AX for the assignment to *r.ax*, the REGS union under Lattice allows one to assign values to either a struct of sixteen bit values or one of eight bit values... the latter is generally more convenient. To set the AL value to two in the union *r*, one would say

```
r.h.al = 2;
```

the *h* being the internal name of the struct for eight bit values within the REGS union.

Having set up the values one wanted to pass to DOS in an appropriate union, one would execute the call though *intdos*, as with

```
intdos(&r,&r);
```

This passes the addresses of the unions to *intdos*, which can index off them to find the values to stuff into the 8088's registers. The first argument is the address of the structure that holds the register values to be used going into the call. The second one will hold the resultant registers when the call has been completed. As we don't care what happens to the data in *r* after the call has executed, I've used the same union for both. In reality, one can have separate unions if one wants to preserve the values of the calling registers for some reason.

The *intdos* function returns the 8088 flag status word, which is a singularly in-

convenient way to deal with it, methinks. However, C functions like to return something. In using DOS calls, especially under DOS two, it's important to know the status of some of the flags, particularly the carry flag, as this is used by DOS to signal the success or failure of the call.

Sadly, Lattice doesn't mention how the flags word is structured... it took me a bit of looking to find it. It's something one rarely uses, even under machine language, as there are instructions to test its bits indirectly. Here's the flag status word in all its glory.

```
0       carry
2       parity
4       auxiliarry carry
6       zero
7       sign
8       trap
9       interrupt
10      direction
11      overflow
```

The undefined bits don't do anything.

We might throw an *intdos* call, then, by doing this

```
if(intdos(&r,&r) & 1) {
        /* this code handles failure */
}
else {
        /* this code handles success */
}
```

The bitwise *and* tests the first byte in the flag status word returned by *intdos*, which is the carry flag. If the carry flag is not set, that is, if the test returns zero, or false, the call has been successful.

While this process gives one access to absolutely everything that DOS can do, and is theoretically all one needs to handle DOS, it isn't very convenient. You have to essentially write machine language in C, arguably the worst of both worlds and very cumbersome. One is constantly doing low level things like setting the disk transfer address, counting up some number of bytes into a string to extract a value and so on, things that higher level languages can usually be expected to take onto themselves. This is very low tech if you are writing elaborate DOS stuff into a program.

It also means keeping a... gak... machine language DOS manual around. This is very tacky in C.

Linkages

Under Lattice three one doesn't usually have to deal with DOS at this level unless one feels particularly penitent. There is a higher level of DOS interface functions built into it, one which requires none of the really heavy bit meddling that *intdos* does. In fact, the higher DOS functions behave very much like the rest of C. They're almost civilized.

If you're going to get into file handling, you should ideally use the C level file manipulation functions unless there is a good reason not to, as this does at least point one's code towards portability. There are, of course, a number of good reasons not to. One of the most prevalent of these is that letting DOS do it is usually faster if you're simply moving large chunks of raw data on and off the disk.

To this end, there are Lattice C functions that recreate all of the DOS two calls... conveniently. As such, for example, you open a file, as we did with the complicated machine language stuff a while ago, by simply throwing a

```
dopen("FROGFILE",2);
```

This function returns a file handle if it's successful or negative one if it bombs, that is, if FROGFILE has the bad grace not to exist, or if it can't be opened for the attribute passed to the function.

This is an example of a real slick bit of DOS meddling at this level of C. At least, *I* think it's slick. It reads the whole of a file into a buffer... the buffer having been previously assigned through *malloc( )*

```
int fh;
long filesize();
fh = dopen("FROGFILE",0);
dread(fh,buffer,filesize("FROGFILE"));
dclose(fh);
```

This is a bit stripped down... it lacks any sort of error checking and would probably

```
dir()   /* little program  to do sorted  directory with dos  calls */
        /* copyright (c) 1986 steve rimmer - not for use by aliens */
{
        struct FILEINFO d;
        char *p,*a[192];        /* maximum of 192 entries */
        unsigned int i,j,k;

        if (p = malloc(4032)) {
                i = 0;
                k = 0;
                if (strlen(argument) == 0) {
                        strcpy(argument,"*.*");
                }
                if (strlen(argument) == 2 && *(argument+1) == ':') {
                        strcat(argument,"*.*");
                }

                if (dfind(&d,argument,16) == 0) {
                        stash_dir(d.name,d.size,p+k,&d.attr);
                        a[i++] = p + k;
                        k = k + 21;
                        while(dnext(&d) == 0) {
                                stash_dir(d.name,d.size,p+k,&d.attr);
                                a[i++] = p + k;
                                k = k + 21;
                        }
                        tqsort(a,i);
                        j = 0;
                        while (j < i) {
                                puts(a[j++]);
                        }
                        free(p);
                }
                else {
                        puts("File not found");
                }
        }
        else {
                puts("Memory allocation error");
        }
}
```

Listing One: The sorted directory.

want some fleshing out if it were to be included in a real world application unless you particularly favour software crashes.

This bit of code makes reference to another bit of code, a function called filesize. This is... sadly... not part of Lattice C. It must be written by hand. However, it's a good example of the use of a rather powerful DOS function, the search for entry call, or *dfind* to C.

```
long filesize(s)
char *s;

struct FILEINFO d;

if(dfind(&d,s,0)) {
        return(d.size);
}
else {
        return(-1);
```

The DOS call to search for a file match returns all sorts of useful information about the file, including its attribute, its time of creation, its name, of course... this may seem a bit pointless, as one needs the file's name to make the call, but it's handy if one passes the thing a wild card... and, finally, the file's size in bytes. As files can be rather large, larger than the value one can get into a single sixteen bit word, this value is treated as a *long*.

The struct FILEINFO contains the elements

```
char    attr;
long    time;
long    size;
char    name[13];
```

among others. As I've used the size element in the *filesize* function here, you can extract whatever information you need from this data when the call returns. This is an unusual use of this function, but it's extremely flexible and can be used to provide all sorts of information about DOS level files.

The program fragment in listing one is a larger example of the sorts of things one can get together using these calls. These two functions produce a complete sorted directory program which can be included in one's applications to make it reasonably easy to see what's on a disk without having to scoot back to DOS.

This code again uses a buffer allocated by *malloc( )*. In this case, it stores its file names there until it has inhaled them all, and then sorts them.

The symbol *argument* refers to a string that holds the secondary argument to be used by the directory call... such as "*.COM" or "B:". If this is of zero length, the code will append a "*.*" to it so that the DOS calls will work properly.

Each time a directory entry is found, the program saves it in the buffer *p*, saves a pointer to the file information in the array *a[]* and bumps up an offset pointer into the buffer. It's probably worth noting that we aren't saving the file information as anything like the way it's returned by DOS. The *stash dir* code... a bit crude, I know... formats it into strings to make it a bit more amenable to human perception. In fact, it does a bit of magic at this level, formatting the file names slightly differently depending upon the returned file attribute. The file names get sizes attached to them, while the names of subdirectories get the word DIR tacked on. We could get a bit more sophisticated here and omit the dotted directories if we felt like it.

```
stash_dir(s,l,p,a)      /* save a directory entry in ram */
        char *s,*p,*a;
        long l;
{
        int k;

        if (l <= 1024) {
                k = 1;
        }
        else {
                k = l / 1024;
        }

        if (*a == 16) {
                sprintf(console,"%-9s<DIR>      ",s);
        }
        else {
                sprintf(console,"%-12s  %3dk  ",s,k);
        }


        k = 0;
        while (k <= 20) {
                *(p + k) = *(console + k);
                ++k;
        }
}
```

More of the sorted directory.

The final sorting of the file names, having put them all in memory, it ridiculously easy, as Lattice C features a built in data sorting function called *qsort*. There are variations on this function for all the common data types... the *tqsort* I've used here sorts strings.

Actually, tqsort sorts pointers to strings. This is rather different from the usual crude bubble sort one writes for machine language sorted directories. This sort doesn't actually move any data... it simply adjusts the pointers to the name strings in a[] so that they point to the strings in a sorted order. This is highly weird to think about, but having called tqsort, we can print the directory names by simply doing a

```
puts(a[j++]);
```

for j going from zero to however many directory entries were found. The strings will print in alphabetical order, rather than the order in which they came off the disk, because qsort has stacked the deck.

Other Songs

There are a number of other things that DOS can do through C, although they aren't nearly as powerful as the file handling functions. The one that Lattice seems to have become enraptured with is the system time.

The status of the system clock can be found through a DOS call and, as such, though a Lattice C call, too. However, the time isn't returned in any immediately useful form by DOS and, as such, there is a lot of time manipulation code in Lattice to make it useful.

This little bit of code prints the time and date. It does so in a slightly arbitrary way, but it's quick and fairly convenient.

```
struct tm *watch;
long t;
time(&t);
watch = gmtime(&t);
puts(asctime(watch));
```

DOS at C

The time function sets its argument to a long value representing the number of seconds which have elapsed since the beginning of time... this having occurred, as far as the compiler is concerned, on January 1, 1970 at midnight Greenwich mean time. The *gmtime* function unpacks this into the structure *watch*, which holds the number of seconds, minutes and so on. The *asctime* function returns a string that pretties this up into a readable time and date. You can play with this string to extract just the time or just the date if you want to.

There's a similar function to the gmtime listed in the Lattice manual, *localtime*, but I could never get it to work.

There are a number of related bits for this aspect of MS-DOS. The *getclk* function returns the clock in a different format, stashing its data in an eight byte array representing the day of the week through to the nearest hundredth of a second. This is the usual format for packed DOS time... but it isn't as easy to use as the *time* and *asctime* functions we've just looked at. You can set the system clock this way though.

```
char a[8];

getclk(a);
/* change something in the array */
if(chgclk(a)) {
        puts("Bad clock data");
```

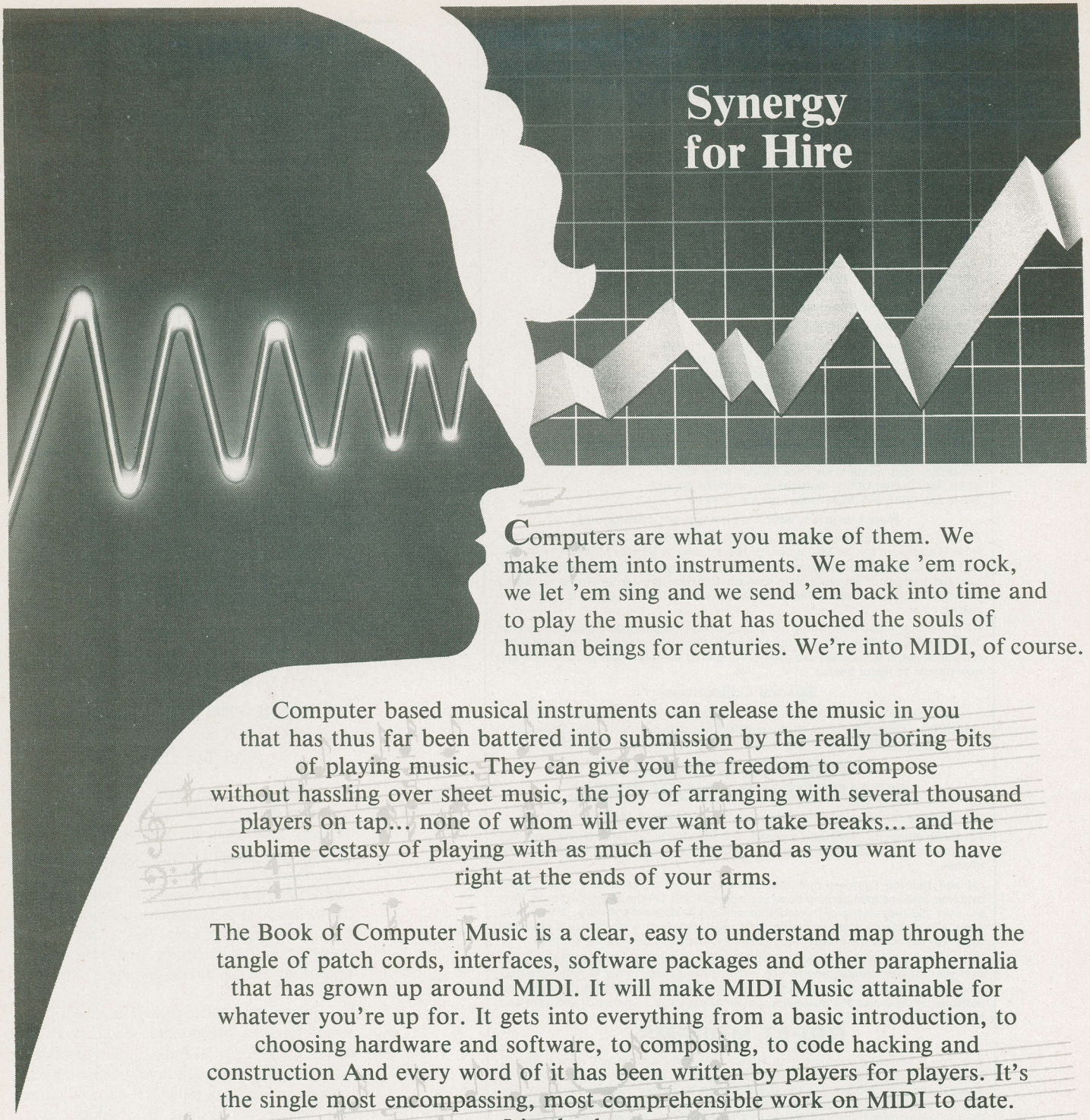
Finally... at least, as final as we're going to get in this article... you can fool with the country dependent information under DOS. This all tied up with functions which set and return some information about the country that DOS thinks it's located in. This includes the format for the date, a string representing the currency symbol, the number of decimals in the currency and so on. It's potentially useful for certain types of software.

The information is passed in yet another struct, this one being either CDI2 for DOS two or CDI3 for DOS three... a tad inconvenient, this. The functions involved are *getcdi* to stuff the functions full of the current value and *setcdi* to update the values with whatever you've stashed into the struct. The DOS interface checks the values in the struct to see if they're legal, so *setcdi* returns an error code if you try to make it do something silly.

C You Later

While using DOS from C is cheating a bit, it does make programs which are potentially just theoretical properly useful. The DOS interface in Lattice C is quite splendid. Allowing for a few inconsistencies... without which C would be just another language... it's eminently useable and a lot easier to get around than the simple *intdos* functions of most lesser compilers.

CN!



Computers are what you make of them. We make them into instruments. We make 'em rock, we let 'em sing and we send 'em back into time and to play the music that has touched the souls of human beings for centuries. We're into MIDI, of course.

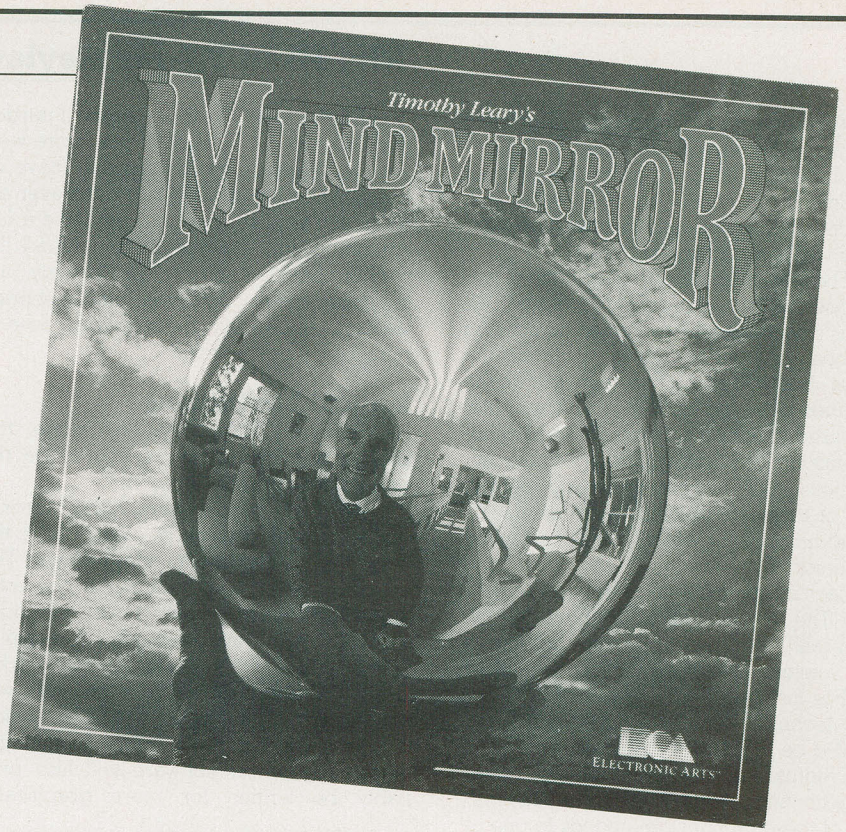
Computer based musical instruments can release the music in you that has thus far been battered into submission by the really boring bits of playing music. They can give you the freedom to compose without hassling over sheet music, the joy of arranging with several thousand players on tap... none of whom will ever want to take breaks... and the sublime ecstasy of playing with as much of the band as you want to have right at the ends of your arms.

The Book of Computer Music is a clear, easy to understand map through the tangle of patch cords, interfaces, software packages and other paraphernalia that has grown up around MIDI. It will make MIDI Music attainable for whatever you're up for. It gets into everything from a basic introduction, to choosing hardware and software, to composing, to code hacking and construction And every word of it has been written by players for players. It's the single most encompassing, most comprehensible work on MIDI to date. It's also home grown.

The Book of Computer Music will be available on the stands and at selected music stores... the natural laws that govern the breaking of guitar strings during solos and the dropping of uninsured rented amplifiers by roadies will invariably see it sold out by the time you go to get one. You can assure yourself of a copy by sending $4.95 to

Moorshead Publications
1300 Don Mills Road
Toronto, Ontario
M3B 1M8

The Mind Mirror Review



Ultimately, everything exists inside your head. External manifestations of reality being largely illusionary, this software package is probably the most relevant thing ever to have been written for a computer.

by Frank Lenk

It's what you'd have to call a sign of the times. Dr. Timothy Leary... renegade psychologist and erstwhile drug guru... has published what he expects to be the first entry in a whole new genre of software... *headware*. Designed by Leary, programmed by Peter van den Beemt and Bob Dietz... under the auspices of Leary's company Futique... and published by Electronic Arts, Mind Mirror attempts to be the first piece of psychedelic software.

Packaging aside, Mind Mirror doesn't look all that psychedelic at first. The obvious, superficial comparison is to those self test articles you find in the back of Playboy or Cosmopolitan, helping you ascertain how good a lover you are or how the colour of your socks reveals your personality. However, Mind Mirror attempts to leave its more vulgar relations behind in the silicon dust, by providing a far more sophisticated analytical system, and far more varied forms of output. It's better written, too.

The principle of Mind Mirror is reasonably simple, once you catch on to it. You pick a subject... yourself, a friend, a public figure... then rate them according to a set of psychological attributes... friendliness, intelligence, inhibitions and others. Mind Mirror generates a series of graphic diagrams summarizing the psychological entity you have described. In the second phase of play, you are asked to respond to a series of life situations, attempting to choose the responses that would be true to the current mind map.

The program is split into these two major phases, analysis and simulation. In the first phase you tend to discover what you consciously think of your subject. In the second phase I found that there are two possible types of learning. By attempting to recreate in actuality the attributes you have ascribed to your subject in the theoretical sense you gain some insight into just what kind of world view that set of attributes really implies. You also learn more about your own preconceived notions of the subject, as your simulation responses generate a second set of mind maps.

What you *think* you think about someone is often quite a bit different from what you think that person would really do in any given life situation.

Psychological Simulations

The first thing you see on the screen as Mind Mirror boots is a spiral of flickering pixels, then the greeting "Hello. I'm Timothy Leary. Welcome to Mind Mirror." This pretty much sets the tone for the whole experience.

Everything happens by means of full screen menus. Choices are displayed as lines of text. You move a highlight up or down the list using the cursors, then hit return to select something. The first menu lets you set the play level, beginner, intermediate, master or professional consultant. The major difference between these levels is the degree of information available to you at any given time and the degree of accuracy required in your play responses.

Next you pick one of two goals, mind tools or mind play. The two routes lead to much the same results, although the first leads you into analysis of your self and your close acquaintances while the second starts you toward "scoping" public figures. Either way, you end up picking a subject, such as yourself, your spouse, your ideal self, a famous personality or whatever. The program presents you with a series of sixteen ruler scales, each representing a psychological attribute of your subject. The attribute will be present never, rarely, often or always... or at some intermediate frequency on the eight point scale. Most modes of play will ask you to rate two or more subjects, for the sake of comparison.

Once you've completed the ratings, Mind Mirror will generate a series of mind maps showing the graphic co-ordinates of your rated subject on a circular plane representing the psychological continuum. Each mind map is divided into eight segments. Adjacent segments represent related attributes, such as confidence, forcefulness, arrogance and so on. Opposite segments will have opposing attributes: forcefulness versus timidity, or pride versus dependence. The specific set of attributes shown will define one of four mind planes: bio-energy, emotional insight, mental abilities, or social interaction. Taken together, the four plots theoretically pin down the subject's entire personality... or rather, your impression of it, since that's all the software knows.

For instance, I booted up and got into the mind tools section, choosing to explore "psychological insight". From the secondary menu I chose to go with "self reflections"... as opposed to autobiography, home life or mating game.

These choices led me to a choice of two exercises, one comparing my actual self versus my ideal self, the other comparing my best and worst selves. I chose the former, and was asked to rate myself on the attributes of being rowdy, grumpy, cute, organized, dumb, shy, intense, closed minded, whining, straight arrow, sad, gung ho, ingenious, VIP, sophisticated and peppy. Each of these attributes appears as a scale with sliding pointer which you can set using the cursor keys.

Each attribute actually has two alternate titles. The ones mentioned above are in "plain talk". You can also view the "shrink rap" versions simply by hitting the space bar. For instance, "sad" corresponds to the more technical term "melancholic". "VIP" can also be thought of as "aristocratic".

Eventually I was informed that I was energetic, timid, know-it-all and uninhibited. Each of these ratings corresponds to one of the mind realms: bio-energy, emotional insight, mental abilities or social interaction. A mind map is displayed for each realm. My ideal self, by the way, turns out to be energetic, touchy, sensible and uninhibited.

At this point you have several options. You can save either or both of the mind maps for later use, or you can go directly to life simulation play. You can run through situations corresponding to any of the four mind realms.

Life simulation is a vast zone of multiple choice questions, punctuated by spurts of typical Timothy Leary text. Here's a tiny sample from the bio-energy realm. First comes the warning. "Proceed up the Fallopian tube at your own discretion!" This is followed by the admonition "Remember, you're energetic." Then comes... conception.

One night not so long ago your Father introduced 500,000 spermatozoa into your Mother's Re-Creational Tract. One of these little fellows is going to make up half of you, Frank.

Which do you want to be?
The awaiting egg
A wiggling sperm
Neither one - why bother with this life-and-conception business anyway.
Either one - both are great career opportunities.

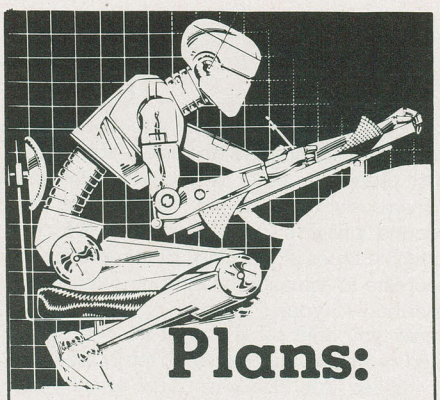
Things go along in this vein for quite some time. As you select each answer you can peek at your mind map. Your original psychological profile is shown as a circular target with a bull's eye. Each of your responses moves your current performance indicator. You try to move the indicator into the target area, hopefully for a direct hit.

That's most of it, in a... if you'll pardon the expression... nutshell. If you score well, you get "passkey" points and can move on to further levels of play. You don't ever actually win or lose, but you can have a fair amount of fun just exploring. I found the mental abilities realm particularly interesting, since it contains a number of brain teasers... spiced with the regulation dose of pure Leary non sequitur.

Logical Limitations

It's hard to know how to judge this program... which may of course be the perfect compliment to pay it.

As an intellectual event, Mind Mirror is under several constraints. The first is the degree of available computing power. The idea of graphing your inner self is inherently appealing, but Mind Mirror can only go a short distance toward the goal. A sequel... Head Coach... is already in the works. Leary promises that the new program will have many times more variables, which should allow for much more meaningful maps. The newer software will also probably be written for more graphically oriented equipment and substitute icons for some of the less scrutable text.



Plans:

Software:	**Timothy Leary's Mind Mirror**
System:	**IBM PC, PCjr, Tandy 1000, Apple II, Commodore 64 and 100 compatibles**
Application:	**Self awareness**
Publisher:	**Electronic Arts, 1820 Gateway Drive, Suite 200, San Mateo, California 94404, telephone (415) 571-7171**
Price:	**$34.95 US**

The main limitation of Mind Mirror has to do with how well you can relate to Leary himself. A lot of the jargon used in the program... and all of the concepts... is hard core Timothy Leary. Leary is a shrewd thinker even at the worst of times... after all, you don't get to be a professor at Harvard solely on the basis of boyish charm and good looks. However, there's no denying that Tim's ideas are not for all tastes. Those who do use Mind Mirror are therefore likely to be the ones who need it least.

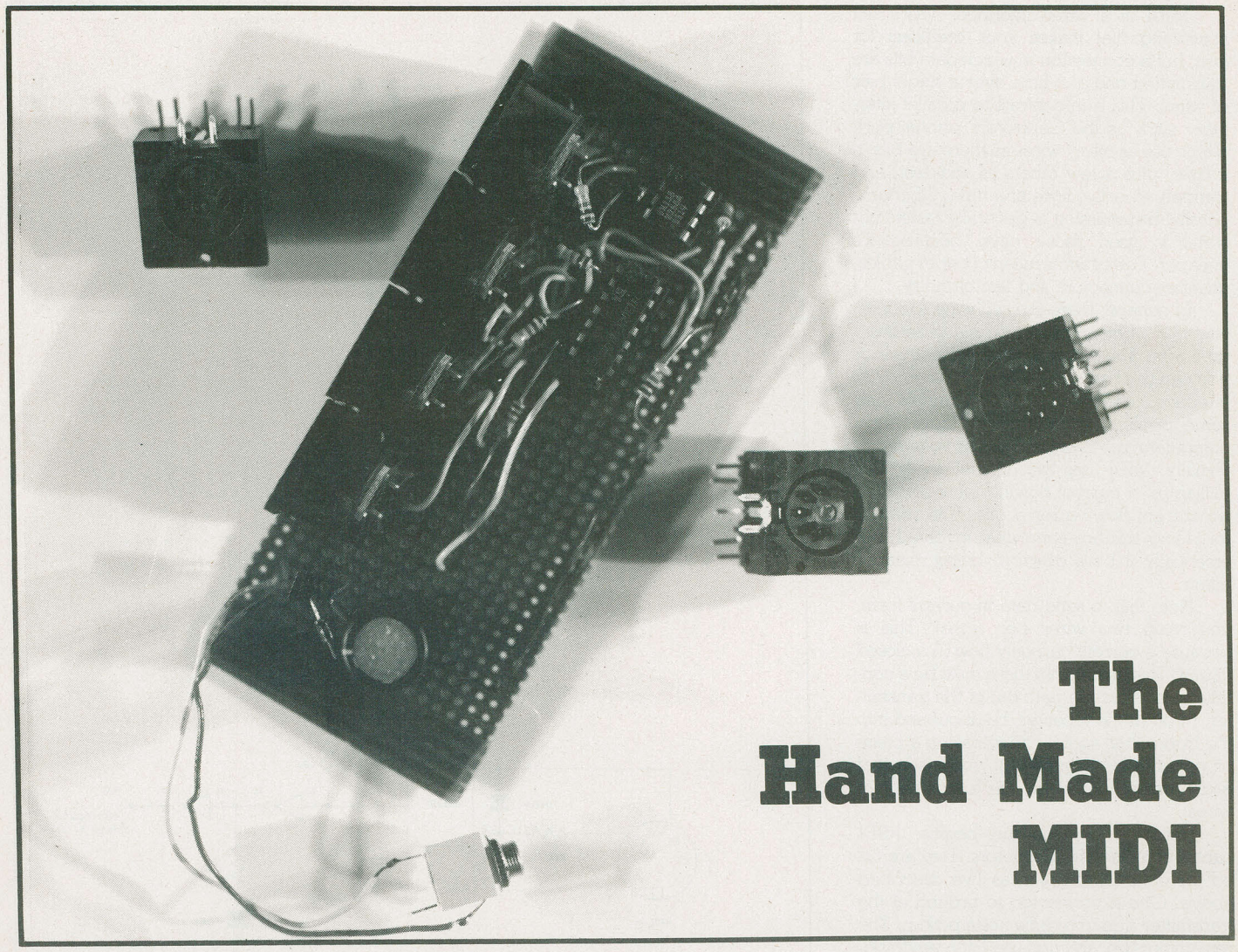
Judged purely as an act of programming, Mind Mirror... written in C, according to Leary himself... is curiously unsophisticated. Most of the displays consist of forty column text. The occasional decorative graphics are relatively crude by today's standards. The functional graphic charts are clear enough, but hardly more spectacular than what might spew out of Lotus 1-2-3.

Furthermore, Mind Mirror has some significant failings as far as all round usability is concerned. The worst of these is its inability to deal with a composite monochrome monitor connected to the IBM graphics card. All the text and graphics are geared to RGB display. Furthermore, the program disk seems to be formatted in something called EA Mini-DOS, so that the only way to run it is by booting. This renders outside display tools such as the DOS MODE command inaccessible. The program itself offers only one configuration choice. You can run it with the keyboard or a joystick. The forty column text is big enough to be decipherable in monochrome, but let's be reasonable. Monochrome display is pretty much a solved problem by now.

The software also suffers from a failing common to most adventure games. You spend far too much time rereading the same sections, while other sections go completely undiscovered and unexplored. I've spent several long evenings with Mind Mirror, yet I'm certain there are major areas of the system that I've never stumbled into. The documentation is not much help in this respect. It focuses on theory rather than practicalities, even including a lengthy interview with Leary.

Mind Mirror is perhaps most interesting not as a mirror of your own mind, but rather that of its illustrious... or is that *infamous*... author. Anyone looking for a good bit of Leary's jocular insights should enjoy Mind Mirror, if only for the quality of the writing. It's not the best book Leary has written, but then again it does mark something of a new direction for him. The sequel should be worth waiting for.

Whether you agree or disagree with what he's saying at any particular moment, there's no doubt that Dr. Tim is a master entertainer. His forte is juggling semantics, rearranging symbols and concepts into diverting new patterns. I suppose this is what philosophers have always been about. It's good work if you can get it... and there are so few people nowadays who do it as well as Timothy Leary. **CN!**



The Hand Made MIDI

One does not normally think of older CP/M based systems as being capable of supporting MIDI. However, if you want to get right into the grotty details you can get them singing. Here are the details, for hackers only.

by Shane Dunne

This is not a full fledged construction project article, but rather a hacker's eye view of the hardware and software involved in coaxing your favourite computer to speak MIDI. However, I have included enough information here for someone with some hardware experience to build their own MIDI interface using as few as three chips.

If the smell of solder makes you feel faint, if you don't feel comfortable modifying existing circuit designs, or if you just don't want to hack furiously into the innards of your prized computer, then I would advise you to purchase a commercial MIDI interface rather than trying to build one.

About This MIDI Business

MIDI is two things. It's a hardware interface specification and a method of encoding data for that interface. These two aspects are quite distinct, and may be separated. For example, the Wersi company makes a series of digital organs which communicate using MIDI data, but over an RS-232 interface... that's the kind used with most computer terminals. A group of artists in Montreal are now building a computerized multimedia studio in which lights, video and laser projectors will be connected to a computer by MIDI interfaces. Naturally these will not communicate using the regular MIDI music codes. New codes will be designed for their special needs.

Let's first look at the hardware specification. This is the part of MIDI that is most clearly defined by the available specification documents.

MIDI uses a five milliamp current loop to carry asynchronous serial data at 31.25 kilobaud. Let's look at that one step at a time.

The Hand Made MIDI

MIDI is a serial interface. That's not something that makes your breakfast for you, but a connection in which data bits are transmitted one at a time over a single pair of wires. This is in contrast to parallel interfaces such as the Centronics printer port, which use as many wires as there are bits in a byte, plus a few others to add zest, and transmit an entire byte at a time. Of course parallel transmission is generally faster, but serial is used more often because it's cheaper. Fewer wires mean cheaper cables, cheaper connectors and less circuitry.

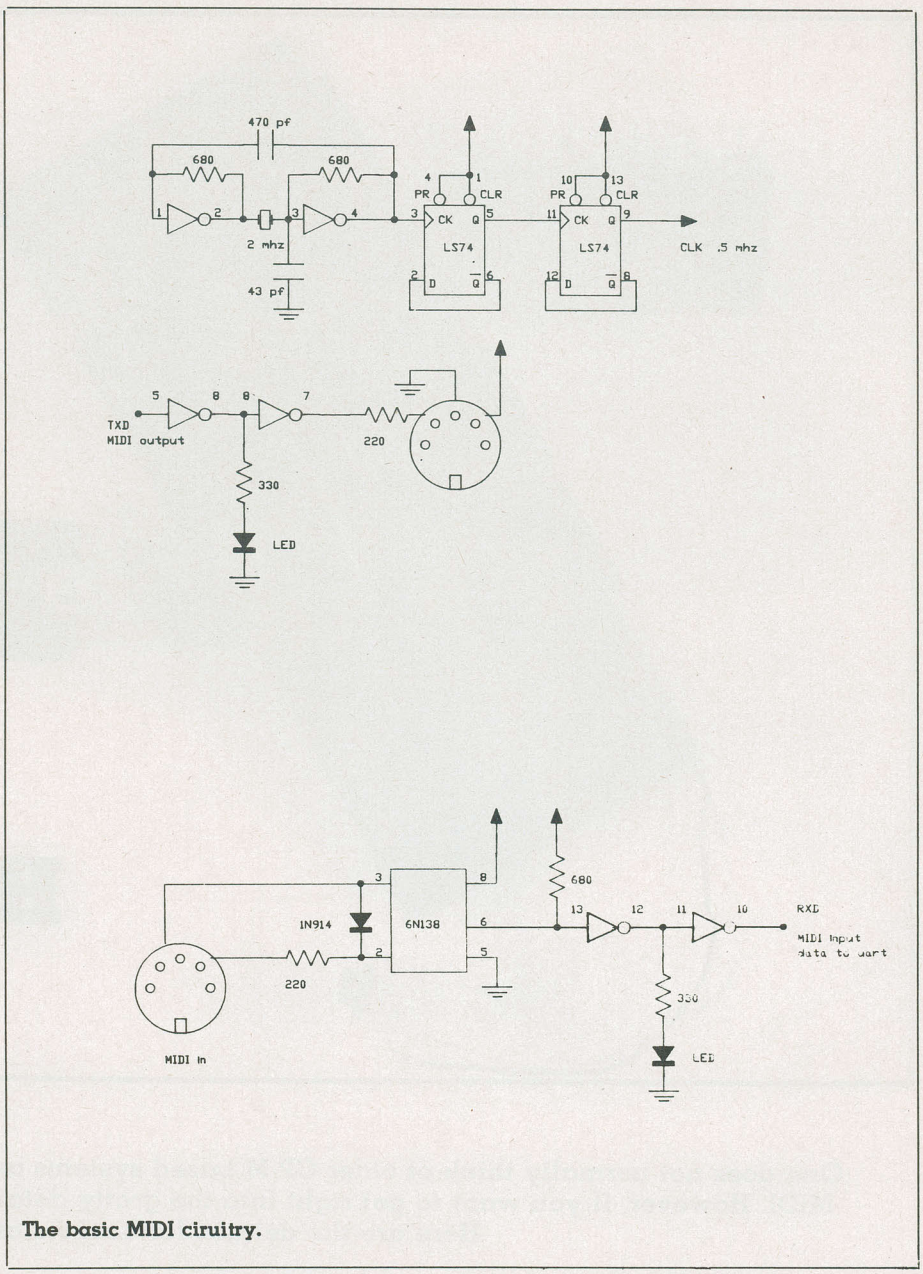
In general, there are two ways to represent bits... I mean binary ones and zeroes... on a wire. You can use two voltage levels or you can use two current levels. The RS-232 interface, used with most terminals and some printers, works with voltages. Most computers also represent bits as voltages internally. MIDI uses two current levels, five milliamps of current flowing for a zero and no current flowing for a one. The reasons for doing this are somewhat involved, but essentially it boils down to being cheaper again.

Note that to send data in current form, you need two wires per signal. This is because a current can only flow in a closed circuit. This means that there must be a continuous conducting path out of the transmitter, through the receiver, back out and into the transmitter again. Draw that on a piece of paper and, hey presto, you'll see that each current loop cable has to contain two wires.

Here's where the fun begins. MIDI cables contain five conductors. Two are used for data transmission as I've described above. One is connected to ground at the transmitter side to reduce noise pickup. The remaining two are not used for anything. The reasons for these extra wires aren't as interesting as one would think they might be. The MIDI designers wanted to use cables that were already available, and which had keyed connectors... the kind you can't force in backwards. The five pin DIN cables normally used to connect tape decks to stereos were a good choice. They're available around the world, they're keyed, and they're cheap, costing about five bucks each at Radio Shack.

There are two ways to transmit serial data, these being synchronously and asynchronously. Synchronous transmission requires a separate clock signal along side the data, and in general is complicated and expensive. I think you've already guessed that the MIDI designers chose the cheap, simple asynchronous method.

Asynchronous transmission avoids the need for a clock by adding a start bit and a stop bit to each character. The start bit is always a zero, and an idle line is always held in the one state, so the transition from one to zero triggers the receiving hardware that a byte is coming in. From there on, the receiver knows approximately when each bit of the character will come in, given that bits are sent at a fixed rate which is known in advance.



The basic MIDI ciruitry.

MIDI moves data around at the rate of 31250 bits per second. A baud is one signal change per second, and for serial interfaces in which each signal change represents one bit, the bit rate equals the baud rate. MIDI falls into this category. Having to know about this sort of thing helps communications engineers command fat salaries, and keeps the rest of us hopelessly confused.

Most MIDI devices have three terminals, marked MIDI in, MIDI out, and MIDI through. MIDI in is for data coming into the device, MIDI out is for data being output by the device, and MIDI though outputs a copy of the data coming in at MIDI in.

UART A Fool, Horatio

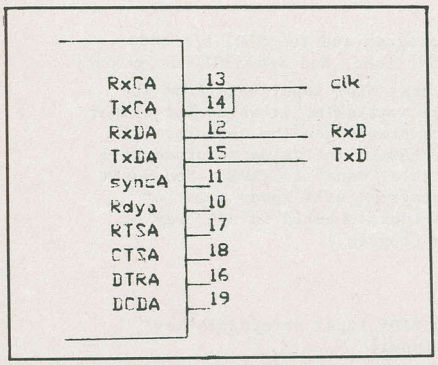
A MIDI interface for a computer consists of two main sub-systems. The first is a serial communications chip, which converts serial data to parallel and vice versa, handling gremlins like start and stop bits on the way. The second is the analogue circuitry used to represent serial bits in current loop form.

To get information into and out of a microprocessor system, it is necessary to use I/O chips. These look to the microprocessor like registers... places where data can be read or written. For asynchronous serial I/O a chip called a Universal Asynchronous Receiver/Transmitter, or UART, is used. When the processor writes a byte to the output register of a UART, the chip clocks the bits of this byte out onto the serial port. When a serial byte is

received from the port, it is placed into the UART's input register to be read by the microporcessor when it is ready.

MIDI uses a very common format for serial communication, this being eight bits per character, one start bit, one stop bit, and no parity with an idle line held at a logic one level. This is exactly the same arrangement as is used by RS-232 terminal lines and printer interfaces, so the same UART chips can usually be used for both. The only difficulty is finding a UART that can work at thirty-one kilobaud. The Zilog Z80-SIO will, and so will the Motorola 6850, but the venerable Intel 8251 will not. However Intel does make a faster chip called the 8256 which will handle up to a million bits per second.

You may be wondering where the strange value 31250 comes from. Well,



Connecting a Z80-SIO to the MIDI circuitry.

most UARTs need a clock input whose frequency is sixteen times the data rate. Sixteen times 31250 is half a megahertz, which is a frequency that should be easy to derive in any microprocessor circuit.

I have a "big board" Z80 computer from Digital Research Computers, which uses a Z80-SIO chip for serial I/O. By supplying my own clock signal to this chip, I was able to use it for the MIDI interface, and hence only had to build the analogue part. If your computer uses a serial chip capable of operating at the right speed, and if you can manage to supply it with the right clock frequency, you can probably do the same thing.

If you can't use your computer's existing UART chip, you will have to add one to the system somehow. This is where I warn all but the most seasoned hardware hackers to stick to commercial hardware, as adding a new peripheral chip to a computer is no mean trick.

The schematic in this article shows the circuit for my MIDI interface, which consists of three parts. The clock generator uses a two megahertz crystal and generates the half megahertz signal used to clock both the receiver and transmitter portions of the UART. The output section buffers the outgoing data and converts it to current loop

Listing 1: Example of MIDI I/O from Turbo Pascal on a Z80 systems.

```
{first declare the port addresses for your UART.  The following ones are
 those for my system.}
CONST   cport = 6;        {UART control port address}
        dport = 4;        {UART data port address}

{now declare the data structures for MIDI i/o}
VAR     mqueue: ARRAY[0..255] OF BYTE;  {the MIDI input queue space}
        icur,ocur: INTEGER;             {input and output cursors for queue}
        OKvec: INTEGER ABSOLUTE $FF0C;  {interrupt vector for normal UART
                                          input interrupt}
        ERvec: INTEGER ABSOLUTE $FF0E;  {interrupt vector for abnormal UART
                                          input interrupt (ie framing error)}
        ErrStat: BYTE;  {if a UART error occurs, the interrupt handling
                         procedure RxErr puts the UART status in here}
        done: BOOLEAN;  {set           ie when user types a character while
                                         waiting for MIDI input}

{of course you'll need a lot of other declarations for a complete
 program.  I'm only showing what's required for MIDI i/o}

{here is a procedure to handle abnormal interrupts from the UART.  We
 use Turbo's INLINE statement to enter machine code directly in the
 Pascal source file here.  Unfortunately you have to hand-assemble the
 code to get it in hex form, which is all INLINE will accept.  However
 you can look on the bright side and figure that this will make you
 use machine code only where it's really needed.  (Or you can just shout
 and scream.  That's what I did.)
 Of course this code is highly machine-dependent.  Here I'm showing you
 what I use in my system, which has a Z80-SIO for serial i/o}
PROCEDURE RxErr;
BEGIN
  INLINE (
    $F5/                {PUSH   AF              ; free up the A register}
    $3E/1/              {LD     A,1             ; prepare to read from  }
    $D3/<cport/         {OUT    (cport),A       ;  SIO read-register #1 }
    $DB/<cport/         {IN     A,(cport)       ; get RR1 (SIO status)  }
    $32/ErrStat/        {LD     (ErrStat),A     ; save for main program }
    $3E/$30/            {LD     A,30H           ; send "error reset"    }
    $D3/<cport/         {OUT    (cport),A       ;  to the SIO           }
    $F1/                {POP    AF              ; restore AF            }
    $FB/                {EI                     ; re-enable interrupts  }
    $ED/$4D             {RETI                   ; return from interrupt:
                                                ;  resets Z80 i/o chips }
  )
END {RxErr};

{here is the handler for normal input interrupts from the UART.  Again
 this is the code which I use with my Z80-SIO, but it should actually
 be quite similar for any system, except for the port addresses.  Read
 this code carefully to see how it implements a circular queue buffer}
PROCEDURE Stash;
BEGIN
  INLINE (
    $F5/                {PUSH   AF              ; free up               }
    $E5/                {PUSH   HL              ;  some                 }
    $D5/                {PUSH   DE              ;  registers            }
    $21/mqueue/         {LD     HL,mqueue       ; HL will be a pointer
                                                ;  into the queue       }
    $ED/$5B/icur/       {LD     DE,(icur)       ; get icur value        }
    $1C/                {INC    E               ; increment modulo 256  }
    $ED/$53/icur/       {LD     (icur),DE       ; store back in icur    }
    $19/                {ADD    HL,DE           ; use this as an offset
                                                ;  to index into mqueue }
    $DB/<dport/         {IN     A,(dport)       ; get MIDI in byte to A }
    $77/                {LD     (HL),A          ; store it in the queue }
    $D1/                {POP    DE              ; restore               }
    $E1/                {POP    HL              ;  the                  }
    $F1/                {POP    AF              ;  registers            }
    $FB/                {EI                     ; re-enable interrupts  }
    $ED/$4D             {RETI                   ; return from interrupt:
                                                ;  resets Z80 i/o chips }
  )
END {Stash};

{You will also need some code to "install" these interrupt handlers, and
 generally prepare the system for MIDI i/o.  This means setting up the
 UART in the correct mode, and making sure that the interrupt vectors
 for UART interrupts point to the routines RxErr and Stash, as appropriate.
```

form. The input section uses an opto isolator to transform incoming current loop data to TTL compatible form for input to the receive portion of the UART. Both the input and output sections also contain LEDs which light whenever a zero bit is detected, thereby allowing you to observe activity on the MIDI line. The reason it lights for zero, not one, is that idle MIDI lines are held in the one state. Thus the light stays off when the line is idle, and flickers when data comes along.

I've also indicated how these circuits would be connected to a Z80-SIO and a Motorola 6850. These are not complete circuits, but are intended to show how the analogue and UART sections fit together. The exact connections will depend on your specific system.

Note that the half megahertz clock signal, identified as CLK in these figures, is a fairly high frequency beast. Therefore it's best to keep the clock wire as short as possible to avoid generating radio frequency interference. Ideally, keep the clock circuit in the same box as the UART, or run a shielded cable if this is not possible.

Programming With MIDI

Once you have a MIDI interface, home-built or commercial, you will need to do some programming to make it do things. MIDI programming is a rich subject, one which is beyond the scope of this article to do justice to. However, I'll point out a few things specific to this project here.

The trickiest thing about MIDI programming is speed. The 31250 bits per second means one byte every three hundred and twenty microseconds. This means that your program has to be able to respond mighty fast to avoid losing input bytes. If you are only interested in MIDI output however, that is, to use a synthesizer to play pre-programmed tunes, blazing speed is not strictly necessary.

There are some commercial MIDI interfaces, notably the Roland MPU-401, which contain their own microprocessors and handle all the nasty time critical details of MIDI communications. This is cool, but with a little careful programming you can get by quite nicely without having to buy one of these rather expensive gadgets. The following discussion assumes that you will not be using such an intelligent interface.

If you want your programs to receive MIDI input, you will almost certainly not be able to write them all in interpreted BASIC, because interpreted programs are so slow. Assembler is fine, because you can predict how many instructions will be executed between input bytes. Compiled languages like Pascal, Fortran, and the like may be suitable, but can bring on nightmares because you cannot generally predict execution speed in this way.

The best way to handle MIDI input is to

```
 This code is so system-dependent that it's not worth showing you mine.
 Instead I'll just outline the basic structure and highlights}
PROCEDURE InitMIDI;
BEGIN
  icur := 0; ocur := 0;          {zero both queue cursors}
  {      .
         .
         .
   here you set up your UART for the correct mode.  Turbo Pascal's
   "PORT" input and output facilities are very useful for this.
         .
         .
         .}
  OKvec := Addr(Stash);          {set the main UART input interrupt vector
                                  to point to the Stash routine}
  ERvec := Addr(RxErr);          {set the UART error interrupt vector to
                                  point to the RxErr routine}
  {      .
         .
         .
   here you will probably need to send a last command or two to your
   UART to enable its interrupts.
         .
         .
         .}
END {InitMIDI};

{The interface between your Pascal main program and the MIDI i/o code
 consists of just two routines: GetMIDI for input and SendMIDI for output}
{GetMIDI is a function which returns the next MIDI input byte from the
 MIDI input stream.  If there isn't a byte available, it waits for either
 a MIDI byte to arrive, or for a key to be pressed on the console.  If
 a key is pressed, it returns immediately (note: the value returned will
 be garbage!), having set the global variable "done" to TRUE.  You don't
 have to do it this way, but since many programs will spend a lot of
 time waiting for MIDI input, it's a good idea to build in some way of
 interrupting this wait, i.e. to stop the program.}
FUNCTION GetMIDI: INTEGER;
BEGIN
  WHILE (icur = ocur) AND (NOT done) DO
    done := KeyPressed;          {wait for MIDI input or console key}.
  IF NOT done                    {if MIDI input}
  THEN BEGIN
    IF ocur = 255
    THEN ocur := 0
    ELSE ocur := ocur + 1;       {increment output cursor mod 256}
    GetMIDI := mqueue[ocur]      {get next MIDI byte from queue}
END {GetMIDI};

{SendMIDI is a procedure which outputs its integer argument as a MIDI
 byte to the MIDI output stream.  This version does not make use of
 any lower level machine-language support routines, but just waits for
 the UART transmit section to become ready (if it is not already) and
 then sends the byte to the UART directly.  If you want to be able to
 do a lot of processing during MIDI i/o, you may want to have MIDI
 output also interrupt-driven.  In this case, SendMIDI would put the
 next MIDI byte into a queue, and a machine-language interrupt handler
 (activated when the UART transmit buffer becomes empty) would take
 bytes out of the queue and pass them to the UART.  If you want to do
 this, make sure your interrupt handler doesn t do anything wierd when
 there isn't any pending MIDI data.}
PROCEDURE SendMIDI(dat: INTEGER);
VAR status: INTEGER;
BEGIN
  REPEAT
    status := port[cport]                {keep getting UART status}
  UNTIL (status AND 4) <> 0;             {until bit 2 set, meaning output
                                          buffer is empty}
  port[dport] := dat                     {pass MIDI data to output buffer}
END {SendMIDI};
```

```
5 'an example of MIDI access in BASIC
10 DIM RXERR%(8)        'reserve 18 bytes for RxErr routine
20 DIM STASH%(12)       'reserve 26 bytes for Stash routine
30 DIM MQUEUE%(127)     'reserve 256 bytes for the queue buffer
40 ' make sure all your simple variables are initialized before
50 ' executing this code.
100 'load the RxErr routine
```

Computing Now! Microcomputer Directory

Finding the hardware or software one wants for one's microcomputer applications is very often an exercise in finding out what exists. Following this, one must locate what one has chosen, often through a labyrinth of dealers and suppliers. Conventional magazine directories and surveys can help with all of this... somewhat... but to date a comprehensive useable directory of what's available in Canada has yet to be published.

Most directories are constructed so as to be easy to compile. This one has been designed to be easy to use. Rather than selecting arbitrary categories, the items in the directory will be classified by system and within each system, in a tree structure dividing them into subclassifications.

This will result in a large directory with a lot of duplication in it. However, it will be a reference highly valued by its readers because of its resulting ease of use. It will be the essential reference work for anyone involved in microcomputers, from single system end users to small and mid-sized businesses. For advertising information contact Denis Kelly at (416) 445-5600 immediately.

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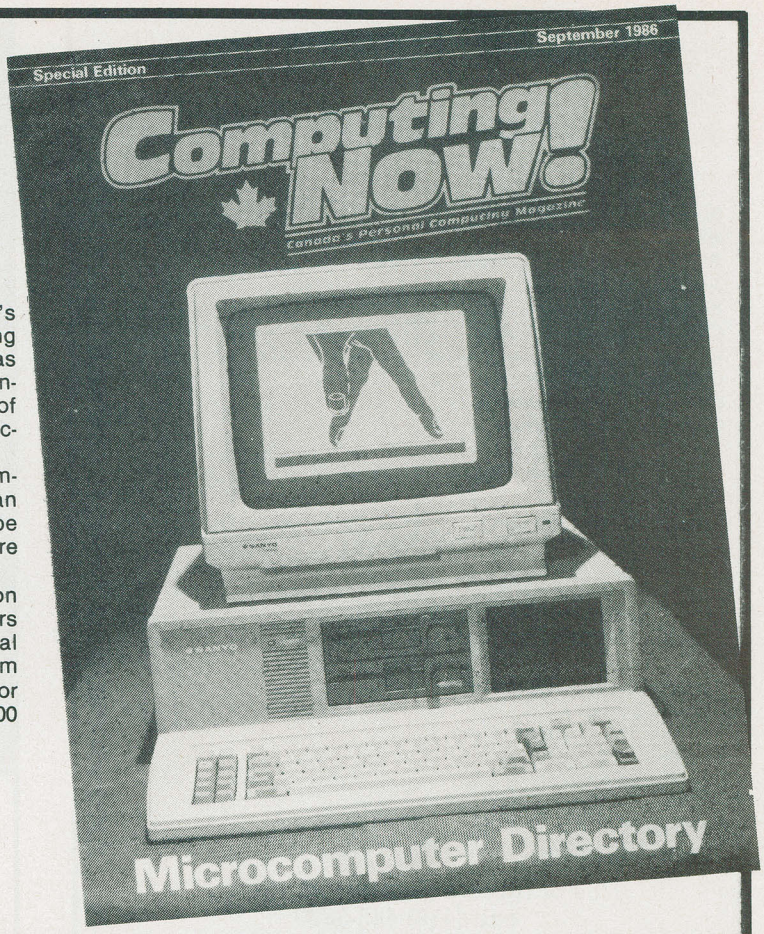

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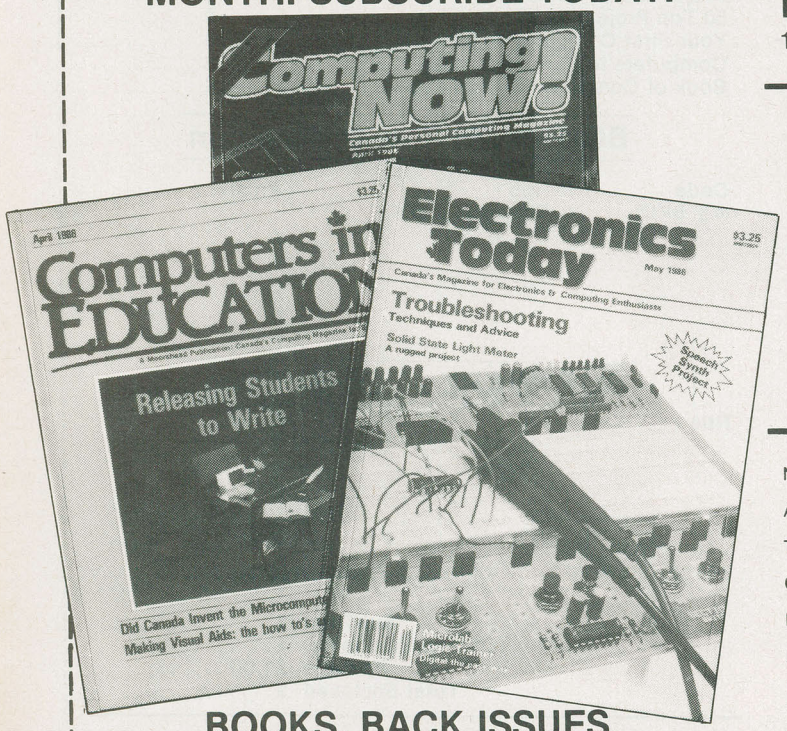

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set up your UART to generate an interrupt every time it receives a character, and then write a very fast interrupt handler in assembler. This interrupt handler just takes the byte from the UART and appends it to a queue which is accessible from the main program. The main program itself can then be written in any language... even BASIC.

A queue is a data structure which allows data to be buffered in a first-in first-out discipline. That is, the first byte to be placed in the queue by the interrupt handler will be the first byte retrieved from the queue by the main program. If bytes come in faster than the main program can process them, they are piled up in the queue, just like people waiting in a line for a bank teller... and will be processed in proper sequence when the main program eventually does retrieve them.

Listing one shows how to write a queue-oriented interrupt handler in Z80 machine language and use it with a Turbo Pascal main program. Listing two shows how to do the same thing with a Microsoft BASIC program. These are not complete programs, but just outline the essential code needed for MIDI communications. The actual implementation will vary with different computers. This code is adapted from the code I have used with my Z80 big board system. Unless your machine is identical, you should treat these programs only as a guide.

I have shown two different interrupt handling routines, called Stash and RxErr. This is because many UARTs will generate one kind of interrupt when a character is received normally, and another kind when some kind of error is detected. The most common is a framing error, which happens when the UART receives a start bit, then clocks in eight data bits, then looks for the stop bit... which is always a one... and finds the line in the zero state instead. If you notice a lot of framing errors, it could be because your UART isn't being clocked correctly.

The approach to storing and using machine code within BASIC, shown in listing two, is a kluge. The Microsoft BASIC interpreter provides various methods of using machine language routines, but all of them are messy. If you are using Microsoft's BASIC Compiler you can write all the machine language stuff in assembly code, use M80 to assemble it, and then link it into your compiled BASIC program using L80.

Parting Words

MIDI has its complications, but need not be as mysterious as it sometimes appears. It is based on the very common technology of asynchronous serial transmission, just like the RS-232 interface used with terminals and printers.

To those who want to brave the slings and arrows and build MIDI interfaces from scratch, I wish the best of luck.

```
110 FOR ADR% = VARPTR(RXERR%(0)) TO (VARPTR(RXERR%(0)) + 17)
120  READ DAT%
130  POKE ADR%,DAT%
140 NEXT ADR%
150 DATA &HF5           'PUSH   AF
160 DATA &H3E,1         'LD     A,1
170 DATA &HD3,6         'OUT    (cport),A       ;cport=6 is hard-coded here
180 DATA &HDB,6         'IN     A,(cport)
190 DATA &H32,0,0       'LD     (ERRSTAT%),A    ;see lines 260,270 below
200 DATA &H3E,&H30      'LD     A,30H
210 DATA &HD3,6         'OUT    (cport),A
220 DATA &HF1           'POP    AF
230 DATA &HFB           'EI
240 DATA &HED,&H4D      'RETI
250 'fill in address of ERRSTAT% which can't be put in a DATA statement
260 POKE VARPTR(RXERR%(0)) + 8, (VARPTR(ERRSTAT%) MOD 256) 'low byte
270 POKE VARPTR(RXERR%(0)) + 9, (VARPTR(ERRSTAT%) \ 256)   'high byte
300 'now load the code for the Stash routine
310 FOR ADR% = VARPTR(STASH%(0)) TO (VARPTR(STASH%(0)) + 25)
320  READ DAT%
330  POKE ADR%,DAT%
340 NEXT ADR%
350 DATA &HF5           'PUSH   AF
360 DATA &HE5           'PUSH   HL
370 DATA &HD5           'PUSH   DE
380 DATA &H21,0,0       'LD     HL,MQUEUE%      ; see lines 510,520 below
390 DATA &HED,&H5B,0,0  'LD     DE,(ICUR%)      ; see lines 530,540 below
400 DATA &H1C           'INC    E
410 DATA &HED,&H53,0,0  'LD     (ICUR%),DE      ; see lines 550,560 below
420 DATA &H19           'ADD    HL,DE
430 DATA &HDB,4         'IN     A,(dport)       ; dport=4 is hard-coded here
440 DATA &H77           'LD     (HL),A
450 DATA &HD1           'POP    DE
460 DATA &HE1           'POP    HL
470 DATA &HF1           'POP    AF
480 DATA &HFB           'EI
490 DATA &HED,&H4D      'RETI
500 'fill in address values not expressible in DATA statements
510 POKE VARPTR(STASH%(0)) + 4, (VARPTR(MQUEUE%(0)) MOD 256)  'low byte
520 POKE VARPTR(STASH%(0)) + 5, (VARPTR(MQUEUE%(0)) \ 256)    'high byte
530 POKE VARPTR(STASH%(0)) + 8, (VARPTR(ICUR%) MOD 256)
540 POKE VARPTR(STASH%(0)) + 9, (VARPTR(ICUR% \ 256)
550 POKE VARPTR(STASH%(0)) + 13, (VARPTR(ICUR%) MOD 256)
560 POKE VARPTR(STASH%(0)) + 14, (VARPTR(ICUR%) \ 256)
570 ' we need some code to set up the hardware for MIDI i/o, in
580 ' particular to set up the UART for interrupt-based operation.  As
590 ' before I can only give an outline of this initialization code.
600 'initialize MIDI i/o
610 ICUR% = 0 : OCUR% = 0
620 ' Put code to set up UART for interrupt operation here.  BASIC's
630 ' IN and OUT instructions will be useful here.
750 'write pointers to Stash and RxErr routines in interrupt vectors
755 '    Note: the addresses FF0C, FF0D, etc. are the ones in my
756 '    system.  Yours will probably be different.
760 POKE &HFF0C,(VARPTR(STASH%(0)) MOD 256)     'lo byte of Stash
770 POKE &HFF0D,(VARPTR(STASH%(0)) \ 256)      'hi byte of Stash
780 POKE &HFF0E,(VARPTR(RXERR%(0)) MOD 256)    'lo byte of RxErr
790 POKE &HFF0F,(VARPTR(RXERR%(0)) \ 256)      'hi byte of RxErr
800 ' Enable UART interrupts, generally get set to go...
810 'Here are the two interface subroutines. BASIC doesn't have
820 'decent parameter passing or return mechanisms, so I'm assuming
830 'the existence of variables MIDI.IN% (where the input routine
840 'puts the next MIDI input byte) and MIDI.OUT% (where the output
850 'routine looks for the next MIDI output byte).
1000 'MIDI input subroutine (GetMIDI)
1010 IN$ = INKEY$       'get console keyboard status
1020 IF (IN$ = "") AND (ICUR% = OCUR%) THEN 510
1030 IF (IN$ <> "") THEN 5000   'go to "keyboard interrupt" code
1040 IF (OCUR% = 255) THEN OCUR% = 0 ELSE OCUR% = OCUR% + 1
1050 MIDI.IN% = PEEK(VARPTR(MQUEUE%(0)) + OCUR%)
1060 RETURN
2000 'MIDI output subroutine (SendMIDI)
2001 '   note: the constant port addresses and AND mask are the ones
2002 '         I use in my system.  Yours will probably be different.
2010 WAIT 6,4   'a concise way to express a wait loop in BASIC
2020 OUT 4,MIDI.OUT%
2030 RETURN
```

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Continued from page 6

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Now you can **test intelligence**, your own and other's, with I.Q. the Test from *Rational Designs* in... where else?... California. Available for the IBM PC/XT or AT, the Test includes verbal, math, logic and visual-spatial questions, and requires a graphics card and 256K RAM. The cost is thirty dollars American for the basic verision, and forty for the deluxe... that one's got a storage case and isn't copy-protected.

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DOS PSCOPE

New from *Intel Corporation* comes DOS PSCOPE, a high-level **language symbolic debugger** for the IBM PC, XT, AT and compatibles running DOS 3.0 or higher. Allowing users to observe program execution at the source code level using high-level procedure and variable names and labels, PSCOPE provides engineers with a symbolic test environment for program execution.

Costing just under one thousand dollars American, you can get more information from Intel Corporation, 5200 North East Elam Young Parkway, Hillsboro, Oregon 97123, telephone (503) 681-2279.

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Interfacing

Pure Data recently launched a new **interface board** for the IBM PC and compatibles. The PD1508M interfaces the ARCNET token passing LAN, has 512K of contiguous or segmented memory and will allow a five-slot PC to function as a full-fledged file server.

For prices, talk to Pure Data at 860 Denison Street, Suite 12, Markham, Ontario L3R 4HI, telephone (416) 494-9563.

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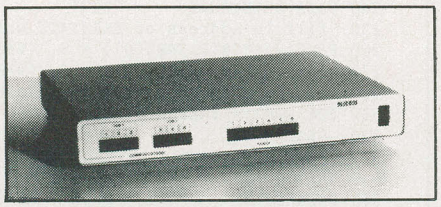
CAD/CAM Control

Solving the problem of constant device switching, *Skylab Technologies*' **serial peripheral controller** is configurable either as a dual ABC switcher or a single ABCDE switcher, and has six port controlled power outlets and one main switch.

With a retail cost of about seven hundred dollars, the controller is available from Skylab Technologies, 95 Glen Cameron Road, Thornhill, Ontario L3T 1N8, telephone (416) 889-4750.



Compiled Higher and Higher

A new **RPG II compiler** or the IBM PC has been released by Lattice. Supporting standard MS-DOS files, the compiler has ISAM files compatible with dBASE III, additional utilities and is compatible with IBM System III, Systems /34 and /36 RPG compilers.

Costing in the neighbourhood of $1,050, it's available in Canada from Software Commodities, 465 King Street East, Toronto, Ontario M5A 1L6, telephone (416) 865-1600.

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● Not a stand alone computer, the TravelMate **series of portable display data terminals** use internal 300, 1200 or 9600 baud modems to communicate with the host computer. These latest members of the TI Silent 700 Family feature retractable LCD screens, built-in 45 cps thermal printers and data communications, and weigh under eight pounds. Their list prices are between one thousand and thirteen hundred dollars American, depending on model.

For Canadian prices and availablity, contact *Texas Instruments*, 280 Centre Street East, Richmond Hill, Ontario L4C 1B1, telephone (416) 884-9181.

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● *Borland International* has announced that its complete line of software programs will be made available on three and a half inch disks **for the new IBM PC Convertible**. The desktop organization software SideKick will carry a list price of $84.95 US, and Reflex the Analyst will sell for $99.95 US; neither are copy-protected, and both will still be available on the standard five and one quarter inch disk.

Borland International, 4585 Scotts Valley Drive, Scotts Valley, California 95066, telephone (408) 438-8400.

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Still More Modems

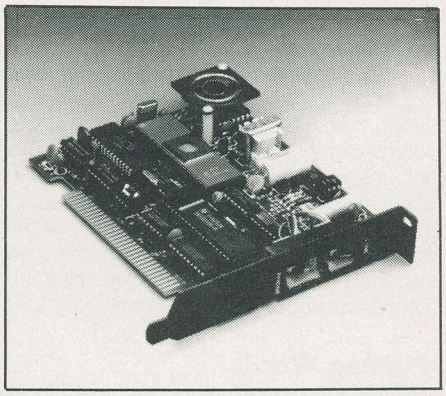
As always happens with our surveys, information keeps pouring in even after we've gone to press. Here's a brief look at some modems that didn't get into the survey in time.

The **Auto-dial Modem 1200** is Hayes compatible, provides automatic dial and answer, requires no extra software, costs $512.00 and is available from *Black Box Canada*, 195 Riviera Drive, Markham, Ontario L3R 9Z9, telephone (416) 477-5885.

From *Tandy/Radio Shack* comes the Modemfone 100, which combines the features of an **electronic telephone and a 300 baud modem**, and can be used with any Tandy computer or data terminal that has an RS-232C interface. Costing $159.95, it's available from your local Radio Shack Computer Centre.

McKenzie Brown Canada is the exclusive Canadian distributor for the *Spectrum Cellular* Corporation 1200 Baud Bridge modem, which is **compatible with cellular telephone systems**, allowing reliable data transmission while the vehicle is moving, and when hand-off occurs between cellular transmitters. For just over one thousand dollars, you can get one from McKenzie Brown Canada, 267 Richmond Street West, Toronto, Ontario M5V 1W9, or call (416) 593-6880 for further information.

Another in the SignalMan series from *Anchor Automation*, the LIGHTNINGi is a 2400 bps, **add-in modem board** for the IBM PC family, and comes bundled with LYNC communications software from Norton-Lambert. Costing five hundred American dollars, it's available from Anchor Automation, 6913 Valjean Avenue, Van Nuys, California 91406, telephone (818) 997-7758.



And finally, from *Multi-Tech Systems*, the MultiModem224EC, a 2400 baud **internal card modem** which incorporates MNP error correction protocol. Bundled with MultiComPC communications software, and costing $699.00 US, it is available from Multi-Tech Systems, 82 Second Avenue South East, New Brighton, Minnesota 55112, telephone (612) 631-3550.

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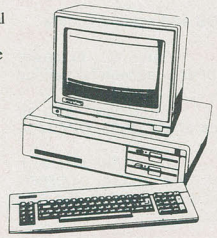

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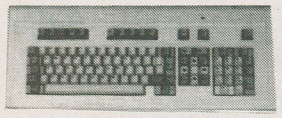

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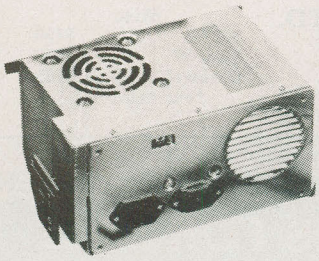

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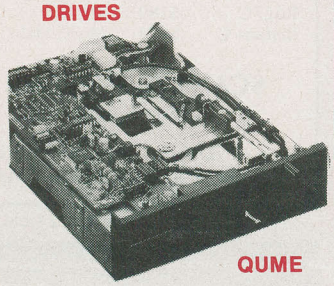

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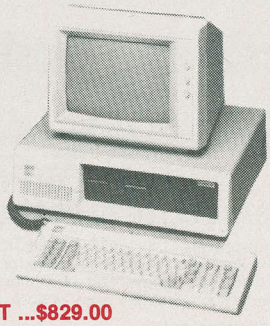

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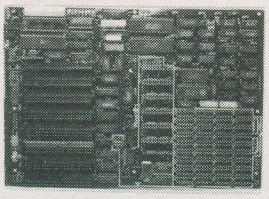
- **KRAM CARD, OK ..... Add $139.00**

640K XT MOTHERBOARDS



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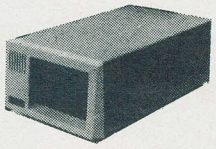

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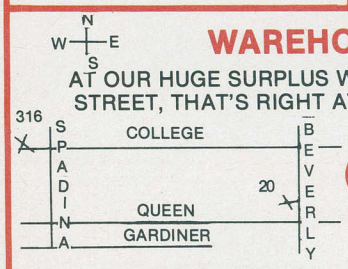

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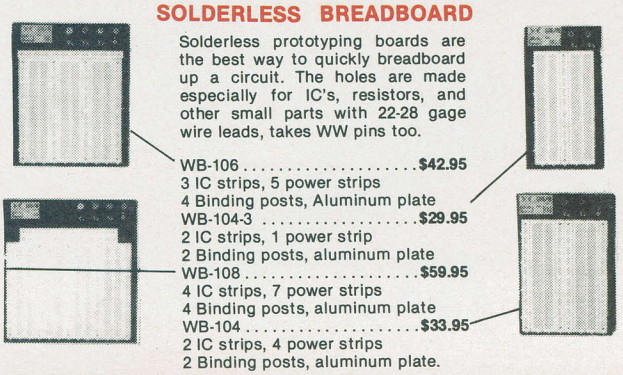

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Standard RAM	512K	256K	512K	256K
Number of Keys	95	95	59	85
Mouse	Yes	No	Yes	No
Screen Resolution (Non-interlaced Mode) Colour Monochrome	640x200 640x400	640x200 720x350**	None 512x342	None 640x352
Colour Output	Yes	Optional	None	Optional
Number of Colours	512	16	None	16
Disk Drive	3.5"	5.25"	3.5"	5.25"
Built-in Hard Disk (DMA) Port	Yes	Yes	No	Yes
MIDI Interface	Yes	No	No	No
No. of Sound Voices	3	1	4	1

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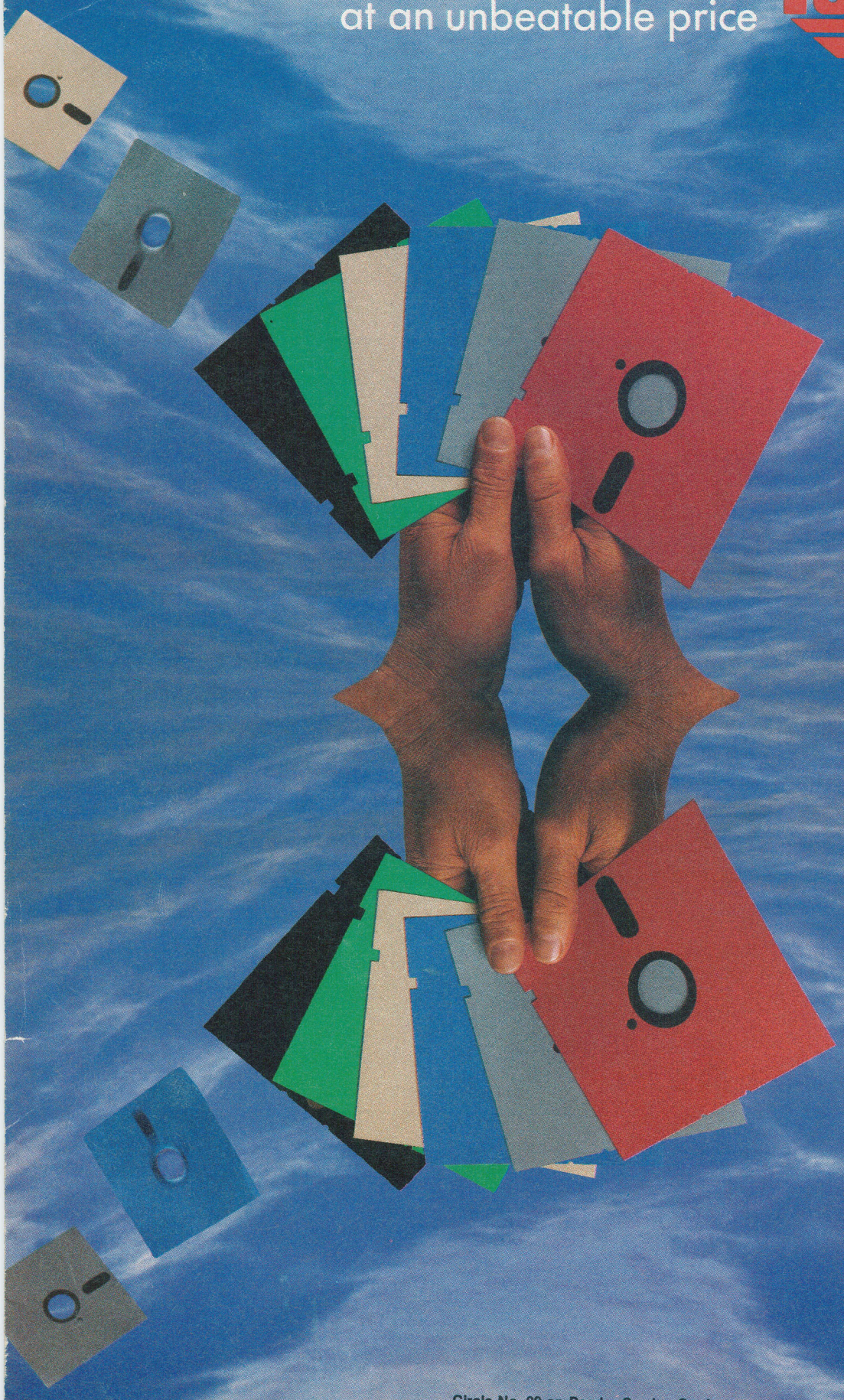

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